COMPUTER FAIRE, INC.
A Prentice-Hall Company

January 4, 1985

Hank Magnuski
Gamma Technology
2452 Embarcadero Way
Palo Alto, CA 94303

Dear Hank,

This is to confirm in writing some of our conversations regarding the Fourth Amateur Radio Computer Networking Conference on Saturday, March 30th, 1985 at the West Coast Computer Faire.

Your meeting room with a capacity for 50 to 100 people for your use all day on Saturday is confirmed. I will be going to the Moscone Center on Monday so should be able to let you know during the week just what room you will have.

Enclosed is a prospectus for exhibit space. When you return it, indicate at #6 that yours is a non-profit organization and also include a description of the type of area that would be most suited to your needs. The contract should be returned to the East Coast address on the bottom of the contract. Exhibit services will take care of your exhibiting needs from then on.

Note that on the back of the prospectus is a partial list of exhibitors. There might also be other information on the folder that you can use in your newsletter.

Hotel information is as follows:

Sheraton Palace, headquarters hotel, 392-8600, $95 single, $110 double

Meridian, 974-6900, $75, $95

Holiday Inn, Civic Center, 626-6103, $68, $78

St. Francis, 397-7000, $95, $105

The deadline for a guaranteed reservation is one month before show date. That means that you are guaranteed a room at the discount price (as listed above) if you reserve one a month before the show. You may be able to get a room after that deadline, but they won't guarantee it.

Let me reiterate show times and prices, too. The hours are 10:00 a.m. to 6:00 p.m. each day. Prices are as follows:

	Four Day	One Day
Pre-registration	$15	N/A
On-site	$20	$12

611 Veterans Boulevard
Redwood City, California 94063
415/364-4294

Wholesale (retail stores, exhibitors, user groups, etc.) Minimum number must be ordered.	$10	N/A

You will be getting more information on ordering tickets in bulk.

About five weeks before the show I will need to know what kind of tables and chairs you will want and how you will want them arranged. If you need some audio visual materials, let us know that at the same time. We can provide some.

We will also want to know explicit details about the conferences you plan in order to include them in the Random Access Guide and program. Our deadline for the program is six weeks before the show so we would need information from you at least a week before that to be able to integrate it properly. Right now I don't have firm deadlines for the RAG but assume sometime around the end of January and the end of February for issues coming out early February and early March. I will let you know definitely what the deadlines are. Whatever information you can provide, such as some of the topics or names of people speaking, will be helpful.

I'm glad we can work together to include the Fourth Amateur Radio Computer Networking Conference in the 10th West Coast Computer Faire. It should be good for both organizations.

I'll be talking to you soon. Call if you have any questions.

Sincerely,

Carol Grant

Carol Grant

West Coast Digipeaters, Mailboxes and Gateways

Site Location	Call Sign	Freq	Hgt ASL	Notes	Coverage Area
Mt. Ashland	WB6NWP-1	145.01	5000'		Southern Ore./Mt. Shasta
Mt. St. John	W6AMT-7	145.01	8000'		Sac Val to Mt. Ashland
Rancho Cordova	KB6JM-1	145.01	100'		Sacto County OES
Richmond	W6CUS-1	145.09/7097 GATEWAY		#	Richmond Red Cross
Berkeley	WD6CMU-1	145.09/220.95	1000'		SF Bay area
Oakland	K6VCO-2	145.09	700'		San Francisco Bay Area
Menlo Park	KA6M-1	145.09		#	S San Francisco Bay Area
Palo Alto	WB5VUL-1	145.09		#	S San Francisco Bay Area
Saratoga	N6JOA	145.03	For CDF traffic, also on 5.01		
Black Mt.	KA6NAN-1	146.58	2400'		San Francisco Bay Area
Loma Prieta	W6AMT	145.01	3800'		SF Bay Area/San Joaq Val
Morgan Hill	G8HJD	145.03	1000'		CDF Hq. also 145.01
Monterey	K6LY	146.58 (soon 145.01)			Monterey low level
Williams Hill	W6AMT-1	145.01	2800'		Salinas Valley/Cent Coast
Fremont Peak	W6BXN	145.01	4300'	*@	Sacramento Val/SJ Valley
Bald Mt.	WB6AIE-1	145.05	5300'		San Joaquin Valley
Clovis	WA6OSA-1	145.05		#	Fresno area (gateway -2)
	WA6OSA-2	145.01		#	Fresno (gateway to -1)
Park Ridge	WA6RWN	145.01	8000'	@	San Joaquin Valley
Blue Ridge	WA6YLB	145.01	5700'	*@	San Joaquin Valley
Arroyo Grande	W6IXU	145.01	200'	#	South Central Coast
Santa Ynez	W6AMT-2	145.01	4000'		South Central Coast
Santa Barbara	WB6DAO	145.36			Arroyo Grande/Santa Barb
	KA6SOX-1	145.01	3200'		Arroyo Grande/San Diego
	K6TZ	145.36	400'		Santa Barbara
Los Angeles	WB5EKU-2	145.36	dualport '		Simi, San Fern Val, SD
	(WB5EKU-12	220.95	9.6 K Baud		Simi, San Fern Val, SD)
	WB6YMH-2	145.36		#	Los Angeles/San Diego
	N6BGW	145.36/146.145		#	Los Angeles
Fullerton	WA6VSE	145.01	300'		LA/San Bernardino/SD
Mt. Ktot	AA6TN-1	145.01	8600'		LA/Big Bear Mt.
Palos Verdes	W6AMT-3	145.01	1500'		Los Angeles/San Diego
	NK6K-1	145.01	1500'		Los Angeles/San Diego
	WA6OZJ	145.36			Los Angeles Basin
Sierra Peak	N6BMO-1	145.01	2400'		Los Angeles/San Diego
	W6AMT-4	145.01	2400'		Los Angeles/San Diego
Cucamonga	KD6SQ	145.01		#	14.103 gateway
Laguna Beach	WB6UUT	145.36		#	Los Angeles/San Diego
San Diego	WB6HHV-1	145.01	500'		San Diego (soon higher)
	W6SE	145.36			San Diego (Encinitas)
	W6MNO	145.36			San Diego
(Mt. Otay)	WB6WLV	144.76			San Diego/Los Angeles
Torrey Pines	KA6IQA-1	145.01		#	Gateway to EASTNET via satellite

* = moving to 145.05 at any time
\# = mailbox system on line
@ = capable of remotely changing frequency

08-Aug-85

West Coast Digipeaters, Mailboxes and Gateways

Coming soon to a hill near you:

Sonoma Mt.	KA6ATN	145.01	2500'	@	N. SF bay/Sacto Valley
Mt. Vaca	W6AK-1	145.05	2300'	@	Sacramento Valley
Melcher Hill	WA6FSP-1	145.03	1000'		S San Francsco Bay Area
Mt. Allison	WB6RFW-1	145.01	2600'	@	Sacto Valley/So. SF Bay
Black Mt.	N6IIU-1	145.01	2400'	@	San Francisco Bay Area
White Mt.	WA6RWN-1	145.01	14,200'		So CA/No AZ/So NV
Onyx Mt.	W6AMT-5	145.01	9000'		Las Vegas
Frazier Peak	WA6GML-1	145.05	8000'		Kern Co./LA/San Diego
San Diego	W6AMT-6	145.01	4000'		San Diego/Los Angeles

North/South paths: (all on 145.01 MHz.)

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          W6BXN - WA6RWN                             / NK6K-1
            \       \       W6AMT-2  ---------  \  /    \
            \       \      /  \    \             ><   W6AMT-3
W6AMT-7 - W6AMT - W6AMT-1 <   \     > KA6SOX-1  /  \    \
                           \  \    /                \ WB6HHV-1
                            W6IXU
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NOTE: The above includes only the major digipeaters in the WESTNET system and are NOT the only paths available. The following is meant to be a guide to aid you in finding a workable path.

W6AMT-7 can see W6AMT
W6BXN can see WB6AIE-1, W6AMT, WA6RWN, WA6YLB
W6AMT can see W6AMT-1, WB6AIE-1, W6BXN, WA6RWN, WA6YLB
W6AMT-1 can see W6AMT, W6AMT-2, W6IXU, WA6RWN
WA6RWN can see W6AMT, W6AMT-1, W6BXN, WA6YLB
WA6YLB can see W6BXN, WA6RWN
W6AMT-2 can see W6AMT-1, W6AMT-3, WB6HHV-1, W6IXU, NK6K-1, KA6SOX-1
KA6SOX-1 can see W6AMT-2, W6AMT-3, WB6HHV-1, W6IXU, NK6K-1
NK6K-1 can see W6AMT-2, W6AMT-3, WB6HHV-1, KA6SOX-1
N6BMO-1 can see W6AMT-3, KD6SQ-1
W6AMT-3 can see W6AMT-2, WB6HHV-1, NK6K-1, KA6SOX-1
WB6HHV-1 can see W6AMT-2, W6AMT-3, NK6K-1, KA6SOX-1

If you have any corrections, additions or other information pertinent to this type of list, please send them to me either via the W6CUS-1 mailbox or the W6IXU mailbox. Thank you, Rick WA6NHC, Petaluma.

Attn : Mr. Dick Jansson, WD4FAB
Attn.: Mr. Mark Wilson, AA2Z

A 2300 MHz BAND PLAN

BY

Paul M. Wilson, W4HHK
Box 73
Collierville, TN 38017
Tel.: (901) 853-7373

2300.000 - 2302.000 MHz	-	FM, Repeater INPUTS
2302.000 - 2303.000 MHz	-	FM, Simplex. 2302.500, calling.
2303.000 - 2303.900 MHz	-	C.W. and Beacons, 2303.500, calling.
2303.900 - 2304.000 MHz	-	E.M.E. Beacons, EXCLUSIVE
2304.000 - 2304.250 MHz	-	E.M.E., C.W. and SSB, EXCLUSIVE
2304.025 MHz	-	E.M.E. Calling, C.W.
2304.200 MHz	-	E.M.E. Calling, SSB
2304.250 - 2304.900 MHz	-	C.W. and SSB, weak signal work
2304.500 MHz	-	Terrestrial Calling, C.W. and SSB
2304.900 - 2305.000 MHz	-	Beacons, EXCLUSIVE
2305.000 - 2306.000 MHz	-	Experimental (NO PULSE)
2306.000 - 2307.000 MHz	-	SSTV, RTTY, FAX
2306.250 MHz	-	SSTV Calling
2306.500 MHz	-	RTTY Calling
2306.750 MHz	-	FAX Calling
2307.000 - 2309.000 MHz	-	Packet/digital, Repeater INPUTS
2309.000 - 2309.900 MHz	-	Packet/digital, Simplex
2309.900 - 2310.000 MHz	-	Beacons, EXCLUSIVE
2390.000 - 2392.000 MHz	-	FM, Repeater OUTPUTS
2392.000 - 2394.000 MHz	-	Packet/digital, Repeater OUTPUTS

Continued on Page Two

A 2300 MHz BAND PLAN

BY

W4HHK

2394.000 - 2418.000 MHz	-	ATV (4 - 6 MHz channels)
2400.000 - 2450.000 MHz	-	Amateur Satellite Service

Note: ATV and Amateur Satellite Service overlap 2400.0 - 2418.0 MHz.

- END -

Paul M. Wilson

Paul M. Wilson, W4HHK
ARRL TA
1st 2300 MHz E.M.E. QSO, 1970
Extra Class Amateur License
Radiotelegraph, 1st Class Commercial
Radiotelephone, 1st Class Commercial

cc: AA2Z
W1JR
K2UYH
WB5LUA
[illegible] SCM
[illegible] LBT

ARRL AD HOC DIGITAL COMMUNICATIONS ADVISORY COMMITTEE MEETS IN SF MARCH 31.

THE MEETING STARTED AT 10 AM AT THE HOTEL UNION SQUARE IN DOWNTOWN SAN FRANCISCO WITH 35 ATTENDEES. THE MEETING WAS CHAIRED BY PAUL RINALDO, W4RI , AND ALL THE NOTABLES OF PACKET RADIO WERE THERE. HAROLD PRICE BEGAN WITH AN UPDATE ON THE AMSAT PACSAT PROJECT AND THE 1985 WESTNET MEETING. OLD BUSINESS WAS DISCUSSED REGARDING TURNAROUND TIME FOR PACKET OPERATIONS WITH PRESENT DAY TRANSCEIVERS. IT WAS DECIDED THAT THE NEXT ANNUAL COMPUTER NETWORKING CONFERENCE WILL BE HELD IN ORLANDO FLORIDA DURING THE SECOND WEEKEND OF MARCH. DOUG LOCKHART , VE3APU, WILL FINISH THE X.3 STANDARD AND PRESENT IT AT THE NEXT MEETING OF THE ARRL DCAC. THE NEXT TAPR SOFTWARE VERSION NUMBER 4 WILL BE READY FOR DAYTON AND THE 4.1 VERSION WILL HAVE THE X.3 AVAILABLE. TERRY FOX , WB4JFI, AND PHIL KARN,KA9Q, DISCUSSED LEVEL 3 PROGRESS. IT WAS REPORTED THAT JON BLOOM ,KE3Z,OF THE ARRL LABS IS WORKING ON A LEVEL 3 CODE WRITTEN IN C THAT WILL RUN ON A XEROX 820 BOARD. ISSUES DISCUSSED WERE: USER DYNAMIC ROUTINGS, USER ASSIGNED ROUTINGS, TPI WITH CHECK SUM OPTIONS, ADDRESS ASSIGNMENTS ACCORDING TO (A) CALLSIGNS (B) AREA CODES-ZIP CODES (C)GRID SQUARES, ETC.

HANK MAGNUSKI, KA6M , AND PAUL RINALDO, W4RI, WILL WORK ON X400 STANDARD FOR TRAFFIC HANDLING USE. TOM MOULTON, W2VY, MAY ALSO HELP ON THIS PROJECT. ONE ISSUE IS HOW TO HELP MAILBOX OWNERS SORT ELECTRONIC MAIL, EDIT,DISTRIBUTE, ETC. THERE PRESENTLY ARE NO EASY METHODS DELINEATING THE SUBJECTS,BEGINNING, ENDING, DISTRIBUTION , AND HANDLING OF SUCH MESSAGES. IT IS HOPED THAT THIS INVESTIGATION WILL HELP DEFINE THE METHODOLOGIES UTILIZED IN AMATEUR PACKET THIRD PARTY TRAFFIC AS WELL AT LEVEL 7. NK6K SAID THAT THE TAPR VERSION 4.0 WILL HAVE MULTIPLE CONNECT CAPABILITY AS WELL AS CHANGING THE WORD <u>BEACON</u> TO <u>QST</u>. INSTEAD OF SAYING <u>BEACON</u> EVERY "N", IT WILL READ <u>QST</u> EVERY "N", ETC.

MANY REGULATORY MATTERS WERE DISCUSSED INCLUDING PROGRESS ON THE ARRL PROPOSED RULE MAKING FOR AUTOMATIC BBS OPERATION . IT WAS ALSO DECIDED THAT THE ARRL WILL ASK THE FCC TO EXTEND THE STA ON AUTOMATIC GATEWAY SATELLITE SYSTEMS FOR ONE YEAR ADDITIONALLY, FOR MORE ADEQUATE TIME TO MAKE AN EFFORT IN THIS AREA.

TAPR IS INTERESTED IN COMING OUT WITH A MINIMUM LEVEL 3 BOARD- THE 8530 PROCESSOR WAS CONSIDERED AS WELL AS THE AMD 7910 UNIVERSAL MODEM. ALSO TAPR IS GOING TO MAKE AVAILABLE STEVE GOODES' 9.6 K BAUD MODEM BOARD IN A KIT AND ALSO A 220 RADIO, BUT THIS PROJECT IS AT LEAST A COUPLE OF MONTHS AWAY.TAPR IS DEDICATING ITSELF TO SUPPORTING THE LINKING EFFORTS. TAPR WILL ALSO CONTINUE MAKING THE FAD-PAD , A PACKET ASSEMBLER-DISASSEMBLER BOARD FOR THE XEROX 820 CREATING A SCC DUAL PORT SYSTEM. THIS IS AN UNPOPULATED BOARD THAT CREATES A RELIABLE DUAL PORT DIGIPEATER OUT OF THE XEROX 820. TERRY FOX, WB4JFI, HAS WORKED OUT A CODE FOR THIS"FAD-PAD"THAT WILL ALLOW ITS OPERATION UP TO FOUR PORTS,BUT IS PRIMARILY FOR LEVEL 3 EXPERIMENTERS. YOU MUST PROVIDE YOUR OWN HDLC CHIP (CONTACT FADCA FOR INEXPENSIVE SOURCES).

W4RI REPORTED ON THE EXPERIMENTS OF HIS PACKET ADAPTAVE MODEM (PAM) HF EXPERIMENTS WHICH ARE UNDERGOING TESTS. PHIL KARN HAS WORKED OUT THE BUGS FOR HIS XEROX 820 TNC PROGRAM WHICH PERMITS MULTIPLE CONNECTIONS. HE IS ALSO WORKING ON A LEVEL 3 FORMAT FOR THIS COMPUTER.A PROJECT WAS INITIATED TO ALLOW TESTING OF AX.25 DIGITAL VERIFICATION.

THOSE ARE THE HIGHLIGHTS OF A MEETING THAT LASTED ABOUT FOUR HOURS AND HOPEFULLY WILL BRING US TOWARD GREATER REALIZATION OF OUR NATIONAL LINKING IN AN INTELLIGENT AND EFFICIENT MANNER.

PPRS JUNIOR CORRESPONDENT: NI84A

Pacific Packet Radio Society
P. O. Box 51562
Palo Alto, CA 94303

March 30th, 1985

Mr. Paul Rinaldo, W4RI
American Radio Relay League
225 Main Street
Newington, Connecticut 06111

Dear Paul:

At the meeting of the Board of Directors of the Pacific Packet Radio Society on March 21st, 1985, the following resolution was passed:

Whereas the Pacific Packet Radio Society was one of the first societies formed specifically to encourage the growth of computer networking via radio using all digital concepts and techniques, and whereas the San Francisco area was the site of the nation's first amateur digipeater, and whereas an even greater challenge faces the amateur radio community to establish a transcontinental link, the Pacific Packet Radio Society has decided to establish a unique award to encourage the completion of the first terrestrial transcontinental network link. This one-time award shall be known as the "Golden Packet" award, and the regulations relating to it are listed below:

1. A transcontinental link must be established, with each terminus located within 100 kilometers of either the Atlantic or Pacific Ocean.

2. The system must consist of fixed terrestrial digital store-and-forward radio links using VHF (greater than 144.1 MHz.), UHF or microwave frequencies. Use of HF, satellite, tropo, metscat or moonbounce channels is prohibited.

3. A valid two-way transmission and acknowledgement of previously unknown information (256 characters or more) must occur in real time (less than ten minutes).

4. This competition is open only to validly licensed North American amateurs, and no commercial links or services may be utilized in the path. Club stations are permitted.

5. Proof of the exchange must be adequately documented and submitted to the PPRS. Proof must include a list of the stations in the link, their locations, frequencies used, and a copy of the text exchanged.

6. The reward shall consist of a suitably engraved plaque with the names of all participating stations listed which shall be presented to the ARRL. Each participating station shall receive either a plaque or a certificate.

7. Final decision on the award is subject to review and approval by the Board of Directors of the Pacific Packet Radio Society.

Respectfully submitted,

H. S. Magnuski

H. S. Magnuski, KA6M

ARRL Fourth Computer Networking Conference

by

The American Radio Relay League and the Pacific Packet Radio Society

Moscone Center Room 232, March 30th, 1985

All attendees of the Computer Faire are welcome. Demonstrations of packet radio equipment and relevant publications will be in Booth 833/835.

The papers presented will be in the proceedings, available from the ARRL.

10:30 Opening Remarks and Keynote Speech
Paul Rinaldo, American Radio Relay League

10:45 Pete's Packet Primer - An introduction to Packet Radio
Peter Eaton, Vice President, Tucson Amateur Packet Radio (TAPR)

11:30 Papers from the Proceedings - Applications

"Packet Radio Development - 1985"
Lyle Johnson, President, TAPR
"The Implications of Traditional Operating Practices for Net Design"
Gwyn Reedy, FADCA
"Packet Radio for Distance Teaching in the Third World"
Phil Gray, International Council for Computers in Education
"Packet Radio and the National Hurricane Center"
Joel Kandel, FADCA

12:15 Papers from the Proceedings - Operational Reports

"The Realities of Packet Radio in the ARS circa 1985"
Harold Price, LAPG
"The FADCA Gator Link 1"
Howard Goldstein, FADCA, and Ted Huf, FADCA
"EASTNET: A Year Later"
Bob Bruninga, AMRAD
"Computer Networking in Japan, 1985 and Onwards"
Robert Richardson, Richcraft Engineering
"Activity Report of Japan's PARNET"
Takemi Yamazaki, et al.

13:30 Technical Papers - Part I

"TCP/IP: A Proposal for Amateur Packet Radio Levels 3 and 4"
Phil Karn, AMSAT
"Addressing and Routing Issues in Amateur Packet Radio"
Phil Karn, AMSAT
"Of Virtual Circuits, Datagrams, and the Circular File"
Terry Fox, AMRAD
"CCITT X.224 Transport Layer Protocol Basic Description"
Terry Fox, AMRAD
"Communications Protocols for the Network and Transport Layers"
Gordon Beattie, Jr., RATS, and Tom Moulton, RATS
"Proposal: Recommendation AX.121NA, a Numbering Plan"
Gordon Beattie, Jr., RATS, and Tom Moulton, RATS
"X.3 and X.28 Protocols for Terminal Node Controllers"
Douglas Lockhart, VADCG
"AX.25 Net Operation in the Connected Mode"
Robert Richardson, Richcraft Engineering

15:15 Technical Papers - Part II

"The RUDAK Packet Radio Experiment for Phase III-C"
Karl Meinzer, AMSAT-DL and Hans Peter Kuhlen, AMSAT-DL
"Modifying the Hamtronics FM-5 for 9600 bps Operation"
Steve Goode, CAPRA
"The Frequency Agile Message System"
Dave Borden, AMRAD
"Packet Radio Timing Considerations"
Dave Engle, PPRS
"A More Watchful Watchdog for Microcomputers"
Paul Newland
"Another Application Note Describing a Low-Power RS232 Interface"
Paul Newland
"A Few Thoughts on User Verification Within a Party-line Network"
Paul Newland

833

THE 10TH WEST COAST COMPUTER FAIRE

CORPORATE OFFICE
181 Wells Avenue
[illegible] MA 02159
[illegible]

WEST COAST OFFICE
611 Veterans Boulevard
[illegible]
[illegible]

February 20, 1985

H.S. Magnuski
AMERICAN RADIO RELAY LEAGUE
311 Stanford Ave
Menlo Park, CA 94025

Dear Mr. Magnuski:

Thank you for joining us in celebrating the 10TH Anniversary of the West Coast Computer Faire.

As a participating user group you will receive the following equipment/services at no charge:

since you have a 10 x 20, this equipment will be doubled!

- 10 x 10 booth space
- burgundy and white pipe & drape
- 7" x 44" identification sign
- 1-6' table draped in burgundy
- 2 plastic side chairs
- 9' x 10' grey booth carpeting
- 8 exhibitor badges to members staffing your booth.

In addition, we have discount coupons, worth $4.00 off the price of a ticket purchased at the box office, for distribution to your members. Call us today if you are interested in receiving these coupons! (800)826-2680.

Looking forward to meeting you at the Faire.

Cordially,

Mary Beth Wilson

Mary Beth Wilson
Operations Manager

P.S. Enclosed is a copy of your contract with your booth # assignment. If you have any questions, please do not hesitate to call.

MBW/leb
enclosures

To: All packet radio stations
From: Hank Magnuski, KA6M
Date: March 18th, 1985

Subject: Fourth ARRL Networking Conference - Update

The following message is an update to the information bulletin issued earlier. Please note that times and places published in the previous bulletin have been changed, and the earlier information should be discarded. The Conference promises to be an important meeting, for as of this date over 20 packeteers from major groups around the country have made reservations and nearly 50 preregistration tickets have been sold. Plan to attend the social events before and after the Conference, as you will probably find that these informal gatherings are a good source of information and contacts.

The Fourth ARRL Computer Networking Conference will be in San Francisco this year on March 30th, 1985. The conference, co-sponsored by the American Radio Relay League and the Pacific Packet Radio Society, will be held in conjunction with the Tenth West Coast Computer Faire, which runs from March 30th through April 2nd at San Francisco's new Moscone Convention Center. The tremendous growth and interest in packet radio terminals, equipment, networks and applications promises to make this conference one of the largest and best attended of the conferences given so far. Here is some information you will need to attend this conference:

Location -- The Networking Conference and all activities of the Faire will be held in Moscone Center in downtown San Francisco. To attend the Conference you will need an entrance ticket to the Faire. All Faire visitors may attend the ARRL Conference at no additional charge. All sessions are open to the public, and persons with no previous knowledge of packet radio systems and procedures are welcome to sit in and learn what they can about this new area of personal computer networking.

Dates -- The Conference will be held all day Saturday, March 30th. The Faire runs from March 30th through April 2nd.

Times -- The Faire hours for sessions and exhibits are 10:00 a.m. to 6:00 p.m. every day. The Conference sessions will run all day Saturday, from 10:00 to 6:00. An exhibit booth demonstrating packet radio equipment and operation will be sponsored by the Pacific Packet Radio Society, and will be open all four days of the Faire.

Tickets -- On-site registration for four days is $20. On-site registration for one day is $12. Pre-registration for four days is $15. Through special arrangements with the Faire and the ARRL, a special pre-registration fee of $20 will purchase a four day ticket to the Faire and a complete set of the ARRL Conference Proceedings. Send a check for $20 and a self-addressed stamped envelope to H. Magnuski at the address listed below. Any checks received after March 16th cannot be guaranteed the special rate. Checks received after that date will be processed if possible and your tickets will be available at the Friday night event. Make the check payable to H. Magnuski and send it to 311 Stanford Avenue, Menlo Park, CA 94025.

Conference Proceedings -- The ARRL Computer Networking Conference papers have been a primary source of information on developments in amateur packet radio and digital communications between personal computers.

The Proceedings will be for sale at the Faire for $10, and may be obtained from the ARRL by mail thereafter. They are included in the special pre-registration package mentioned above.

Faire Events -- The West Coast Computer Faire has been the premier trade show in the development of the microcomputer industry. This tenth anniversary session promises to be jam-packed with sessions and exhibits on personal computing. Hundreds of leading manufacturers have signed up for the Faire, and there will be sessions and seminars on almost every aspect of personal computing.

Conference Events -- Times and places for all the networking conference are listed below:

March 29th - 8:00 to Midnite - Network Management meeting at the San Francisco Pizzeria, 418 Beach Street (near Taylor), San Francisco. From the Hotel Union Square take the Bay & Taylor Cable Car to the end of the line. Walk two blocks down Taylor and you're there. (Yes, when cable cars aren't being used as amusement rides, they can be used for public transit.) Everyone is welcome. This will be a test of how late the East Coast packeteers can stay up when beers >= 2. At least one East Coast packeteer has accepted the challenge.

March 30th - 08:30 - Breakfast at Tad's Restaurant, 120 Powell St., SF.

All technical sessions for the conference will be held in Room 232. This is in the East Wing of Moscone Center near 3rd and Howard.

March 30th - 10:30 - Opening remarks and Keynote - Paul Rinaldo, W4RI
10:45 - Pete's Packet Primer by Pete Eaton, WB9FLW.
11:30 - Papers from the Proceedings - Applications
12:15 - Papers from the Proceedings - Operational Reports
13:30 - Technical Papers on packet radio and digital communications. Presentations from the Proceedings, Part I.
15:15 - Technical Papers on packet radio and digital communications. Presentations from the Proceedings, Part II.
18:00 - End of technical sessions

March 30th - 20:00 - Conference dinner at New Joe's Restaurant, 347 Geary St. (between Powell & Mason), SF. Phone: 989-6733. We will need a count of those wishing to attend by noon on Sat.

March 30th - 22:00 - A WESTNET organization and planning meeting will be held immediately following the Conference dinner. Don Simon, NI6A, is organizing this session, and the location will be announced at the Conference.

March 31st - 08:30 - Breakfast at Tad's Restaurant, 120 Powell St., SF.

March 31st - 10:00 - Meeting of the ARRL Digital Communications Committee Location to be announced.

Exhibit Booth -- We will be giving demonstrations and explaining how packet radio works at our exhibit booth (833/835) on the main exhibit floor. Representatives from visiting packet radio societies are welcome to leave copies of newsletters and membership applications at the booth. Also, if you have any specialized equipment you wish to have shown or demonstrated, please bring it along and we will try to include it at the show.

Housing -- Bill Stevens, W6ZM, has reserved a block of rooms for visiting packeteers at the Hotel Union Square, 114 Powell Street, San Francisco, CA 94102. Telephone is 415-397-3000. This hotel is three blocks from Moscone Center, and is one of the least expensive hotels suitable for conference attendees. To get to the hotel, take the Airporter Bus from SFO (approx. $6.00) to the downtown terminal. The Hotel is two blocks away, and you can walk or take a cab. A shuttle bus to the airport stops at the Hotel.

The following hotels are close to Moscone and will have many Faire visitors:

Hotel Meridien, 50 3rd Street, San Francisco, CA 94103. 415-974-6400
This is a new 700 room 36 story hotel with a French accent.

Sheraton Palace, Market & New Montgomery, SF. 415-392-8600
This is the Faire Headquarters hotel, two blocks from Moscone.

St. Francis, Powell & Geary, SF. 415-397-7000
About four blocks from Moscone.

Faire Contacts -- Any questions about the Faire itself may be directed to Computer Faire, Inc. (A Prentice-Hall Company), 611 Veterans Boulevard, Redwood City, CA 94063. Telephone is 415-364-4294.

Coordination Frequencies -- There will be packet radio activity on 145.01 and 146.58 MHz. Voice channel coordination will be on WB6FDT/R, courtesy of the Telephone Pioneers. Frequency is 146.19/.79 coupled to 443.1(out)/448.1(in).

The members of the Pacific Packet Radio Society look forward to your visit, and sincerely hope you will have a pleasant stay in San Francisco.

73, Hank

H. S. Magnuski, 311 Stanford Avenue, Menlo Park, CA 94025 415-854-1927

EIES (DRNET): KA6M,2971
Telemail: HMAGNUSKI/AMSAT
Usenet: ucbvax!decwrl!amdcad!fortune!dsd!dna

Please give this notice the widest possible distribution.

Before the
Federal Communications Commission
Washington, D.C. 20554

PR
FCC 85-169
35723

In the Matter of Amendment of Part 97 of the Commission's Rules to permit automatic control of amateur radio stations.	PR Docket No. 85-105 RM-4879

NOTICE OF PROPOSED RULE MAKING

Adopted: April 5, 1985 Released: April 11, 1985

By the Commission:

1. Notice of Proposed Rule Making in the above-captioned matter is hereby given.

2. The Commission has received a petition (RM-4879) from the American Radio Relay League, Inc., (ARRL) seeking to amend the Amateur Radio Service Rules to permit automatic control of digital communications on all amateur frequencies above 30 MHz.1/ The ARRL notes that Part 97 currently contains provisions for automatic control of stations in repeater, auxiliary and beacon operation but makes no provision for automatic control of routine digital communications. In support of its petition, the ARRL states that a variety of digital codes, such as radioteleprinter, transfer of computer programs, direct computer-to-computer communications and "packet switching" systems lend themselves to a mode of amateur radio transmission where a control operator need not be present. According to the ARRL, present microprocessor and computer technology now routinely present at amateur stations can automatically transmit and receive digital communications, verify receipt of messages and respond to inquiries. The ARRL notes that the use of Computer Based Message Systems (CBMS) are something new in amateur communications and should be encouraged by more experimentation, including automatic control

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1/ The ARRL said that it was not requesting automatic control for frequencies below 30 MHz (HF frequencies) because heavy frequency usage below 30 MHz made manual control of digital communications on those frequencies more appropriate.

which is both feasible and necessary to facilitate further development in the art of amateur radio. Two timely comments were filed. Both supported the petition for rule making.

3. Automatic control in the Amateur Radio Service has previously been approved for repeater, auxiliary links and beacon operations.2/ With an ever-growing list of amateur operations where automatic control is permitted, we believe that now may be the appropriate time to expand automatic control to all amateur operations, prohibiting its use only in those situations where there is a justifiable reason why automatic control should not be allowed. Therefore, we invite amateur radio operators in general, and amateurs experienced in automatic control in particular, to submit comments calling to our attention any problems that may arise by expanding automatic control to encompass all amateur radio operations. Our goal is to keep the amateur service abreast of technological developments and to utilize new technology, such as CBMS, where appropriate. On the other hand, we do not want to introduce any innovations into the service which would be disruptive of amateur communications or which would essentially change the character of the service.

4. We propose that any amateur radio station may be under automatic control, except when transmitting on frequencies below 29.5 MHz. As noted earlier, the petitioner did not request automatic control below 30 MHz. However, since automatic control is already permitted for repeater operation between 29.5-29.7 MHz, it is reasonable to make the lower limit for automatic control 29.5 MHz, rather than 30 MHz.

5. These proposed rule amendments would still prohibit automatic control operation in any instance where the station is transmitting third-party traffic. This is in accord with Section 97.79 (d) of the amateur rules which specifies that a control operator must always be present when a third party is participating in amateur radio communications.3/

6. For purposes of this non-restricted notice and comment rule making proceeding, members of the public are advised that ex parte contacts are permitted from the time the Commission adopts a Notice of Proposed Rule Making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting. In general, an ex parte presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's

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2/ For automatic control of stations in repeater and auxiliary operation, see Report and Order in Docket No. 20112, adopted June 11, 1975; FCC 75-706; 40 FR 26524, June 24, 1975. For automatic control of beacon operations, see Report and Order in PR Docket No. 81-823, adopted October 21, 1982; FCC 82-455; 47 FR 50702, November 9, 1982.

3/ See also News Release, Report No. 2028, Mimeo No. 8832, October 25, 1978.

staff which addresses the merits of the proceeding. Any person who submits a written ex parte presentation must serve a copy of that presentation on the Commission's Secretary for inclusion in the public file. Any person who makes an oral ex parte presentation, addressing matters not fully covered in any previously-filed comments in the proceeding, must prepare a written summary of that presentation; on the day of the oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each ex parte presentation must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's Rules, 47 CFR 1.1231. A summary of the Commission's procedures governing ex parte contacts in informal rule makings is available from the Commission's Consumer Assistance Office, FCC, Washington, D.C. 20554, (202) 632-7000.

7. Authority for issuance of this Notice is contained in Sections 4(i) and (303)(g) and (r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and (303)(g) and (r). Pursuant to applicable procedures set forth in Section 1.415, 47 CFR 1.415, of the Commission's Rules, interested persons may file comments on or before June 25, 1985, and reply comments on or before July 25, 1985. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information is placed in the public file, and provided further that the fact of the Commission's reliance on such information is noted in the Report and Order.

8. In accordance with Section 1.419 of the Commission's Rules, 47 CFR 1.419, formal participants must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. Each set of comments must state on its face the proceeding to which it relates (PR Docket Number) and should be submitted to: The Secretary, Federal Communications Commission, Washington, D.C. 20554. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C.

9. In accordance with Section 605 of the Regulatory Flexibility Act of 1980 (5 U.S.C. 605), the Commission certifies that these rules would not, if promulgated, have a significant economic impact on a substantial number of small entities because these entities may not use the Amateur Radio Service for commercial radiocommunication (see 47 CFR 97.3 (b)). In addition, the proposed rules concerning expansion of automatic control in the Amateur Radio Service would not significantly impact on the manufacturers of amateur radio equipment since devices installed to secure the radio equipment from unauthorized use or to detect transmitter malfunction are not usually purchased from such manufacturers.

10. In view of the foregoing, rule making petition RM-4879 filed by the ARRL IS GRANTED.

11. IT IS ORDERED, That the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and the Secretary shall also cause a copy of this Notice to be published in the Federal Register.

12. For information concerning this proceeding, contact Maurice J. DePont, Federal Communications Commission, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachment: Appendix

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations would be amended, as follows:

1. Section 97.3 (m) (3) would be amended to read:

§ 97.3 Definitions.

* * * * *

(m) * * *

(1) * * *

(2) * * *

(3) Automatic control means the use of devices and procedures for control of an amateur station without the control operator being present at the control point.

2. Section 97.79 (b) would be amended to read:

§ 97.79 Control operator requirements.

* * * * *

(b) Every amateur radio station, when transmitting, must have a control operator. The control operator must be present at the control point of the station, except when the station is transmitting under automatic control. The control operator must be a licensed amateur radio operator or permittee designated by the station licensee. The control operator and the station licensee are both responsible for the proper operation of the station. For purposes of enforcement of the rules of this part, the FCC will presume that the station licensee is the control operator of the station, unless documentation exists to the contrary.

3. A new section 97.80 would be added, as follows:

§ 97.80 Operation under automatic control.

(a) An amateur radio station may be operated under automatic control:

(1) when in beacon operation on frequencies 28.20-28.30 MHz; and

(2) when transmitting on frequencies above 29.5 MHz, except when in beacon operation on:

MHz	MHz
50.00-50.06	220.06-222.05
50.08-54.0	222.06-225.00
144.00-144.05	420.00-432.07
144.06-148.00	432.08-450.00
220.00-220.05	

(b) When under automatic control, devices must be installed and procedures must be implemented which will ensure compliance with the rules when the control operator is not present at the control point of the station.

(c) No amateur radio station may be operated under automatic control while transmitting third-party traffic.

(d) Automatic control of a station must cease upon notification by the Engineer-in-Charge of a Commission field office that the station is transmitting improperly or causing harmful interference to other stations. Automatic operation must not be resumed without prior approval of the Engineer-in-Charge.

4. Section 97.85 (e) would be deleted. Paragraphs (f), (g) and (h) would be redesignated as paragraphs (e), (f) and (g), respectively.

5. Section 97.86 (a) would be deleted. Paragraphs (b), (c) and (d) would be redesignated as paragraphs (a), (b) and (c), respectively.

6. Section 97.87 (b) and (c) would be deleted. Paragraph (d) would be redesignated as paragraph (b) and pargraph (e) would be redesignated as paragraph (c). In redesignated paragraph (b), the last sentence would be amended to read: "In such cases, the rules of 97.85 (e) (1) (2) and (3) apply." A new paragraph (d) would be added to Section 97.87 to read, as follows:

(d) Beacons under automatic control transmitting below 432.08 MHz are restricted to the following emissions: NØN, A1A, F1B and J2A.

7. Section 97.114 would be amended by adding a new paragraph (d) as follows:

§ 97.114 Limitations on third-party traffic.

* * * * *

(d) Third-party traffic from any amateur radio station under automatic control.

THE AMERICAN RADIO RELAY LEAGUE, INC.

ADMINISTRATIVE HEADQUARTERS NEWINGTON, CONNECTICUT, U.S.A.

April 9, 1985

Donald Simon, NI6A
2327 Alva Avenue
El Cerrito, CA 94530

Dear Don:

Thank you for your letter and your kind words about the Fourth ARRL Amateur Radio Computer Networking Conference.

I don't think that you should be concerned about the virtual-circuit/datagram controversy affecting the ability to deliver third-party traffic. Your concept of "proxy call signs" is more or less what will happen, no matter how it's packaged. Normally, certainly in the early stages of implementation, virtually everything will be addressed to a particular station, by call sign. But, there is no reason why third-party traffic can't be addressed to a call-sign substitute that stands for "any station" in the area that can deliver the traffic. "CQ" might serve this function.

The work being undertaken for packet-radio message formatting will take into account the type of refile work that KA6M is doing as well as third-party traffic of the traditional NTS or emergency type. It's too early to give you any details.

There's no legal barrier to your putting up a VHF/HF mailbox/gateway if you observe the FCC rules. The VHF part can operate under repeater rules. The HF part must operate with a control operator present at the control site (which could be remote) at all times that the station is in operation. This means in practice that at the control site you have to be able to turn the transmitter off in case of malfunction and be responsible for the content of the messages. One way is to make it impossible for the station to retransmit anything you haven't personally released. Another would be to keep a printer or CRT monitoring the traffic and kill anything that's improper. If you stay within the guidelines on page 71 of October 1984 QST you'll be on solid ground.

73,

Paul

Paul L. Rinaldo, W4RI
Publications Manager

PR:maty

N16A

THE AMERICAN RADIO RELAY LEAGUE, INC. • SECTION TRAFFIC MANAGER

LEADERSHIP OFFICIAL

Section Traffic Manager: East Bay

'85 APR -8 PM 2:16

DONALD SIMON
2327 Alva Avenue
El Cerrito, CA 94530
415-237-1381

QST OFFICIAL JOURNAL

APRIL 3, 1985

PAUL RINALDO
CHAIRMAN, ARRL DIGITAL COMMUNICATIONS ADVISORY COMMITTEE
ARRL

DEAR PAUL:

I'D LIKE TO THANK YOU FOR A VERY FINE SHOW AND VERY EXCELLENT MEETING (DCAC) AT THE 4th ANNUAL ARRL NETWORKING CONFERENCE IN SF.

AS YOU KNOW I AM CONCERNED ABOUT PUBLIC SERVICE AND DISASTER COMMUNICATIONS AND PACKET RADIO. I DO NOT KNOW IF I WILL EVER BE COMPETENT TO JUDGE THE SUITABLE SOFTWARE SYSTEMS PERTAINING TO SUCH THIRD PARTY NEEDS AS THIS IS NOT MY PROFESSIONAL FIELD. I WOULD LIKE TO ASK YOU TO KEEP YOUR EYE ON THAT DEVELOPEMENT (LEVEL THREE) AND PERHAPS COMMUNICATE TO THOSE WHO ARE INVOLVED IN DESIGN AND DEVELOPEMENT, THAT THE NEEDS OF THE PUBLIC SERVICE COMMUNITY SHOULD ALSO BE KEPT IN MIND. I WILL HAVE TO STAY OUT OF THE CONTROVERSY BETWEEN VIRTUAL CIRCUITS VS DATAGRAMS BECAUSE OF IGNORANCE. ON A PRIMITIVE LEVEL, I ENVISION TRAFFIC HANDLED COAST TO COAST TO TRAFFIC MAILBOXES, WHEREIN TRAFFIC OPERATORS (ARES AND/OR NTS) CAN CHECK-IN AND DELIVER IT TO SECTION AND/OR LOCAL NETS. THIS REQUIRES ABILITY TO ROUTE TRAFFIC TO A THIRD PARTY (NON-AMATEUR CALLSIGN). I SUPPOSE THIS CAN BE DONE VIA PROXY CALLSIGNS? I HOPE THAT THIS IS AN ISSUE THAT IS BEING ALLOWED FOR.

SECONDLY, SINCE YOU WILL BE LOOKING INTO X400 FOR KA6M, IS IT ALSO SUITABLE TO, AT THIS TIME LOOK INTO X400 IN REGARD TO NTS THIRD PARTY TRAFFIC (OR ARES THIRD PARTY TRAFFIC)? FORTUNATELY MOST DISASTER TRAFFIC WILL BE LOCAL, BUT THERE SHOULD BE A SIGNIFICANT AMOUNT THAT MUST BE SENT TO REGIONAL, NATIONAL, OR STATE OFFICIALS OVER A NETWORK LAYER. IS THIS WHERE X 400 WILL COME IN? IS IT TOO EARLY TO WORK ON SUCH A STANDARD FOR AMATEUR PACKET RADIO? IN ANYCASE, I THINK THE WORK THAT YOU AND THE GANG ARE DOING IS VERY IMPORTANT AND ALREADY EVEN WITH LEVEL 2 LINKING, WE HAVE ALREADY IMPROVED MANY OF OUR CAPABILITIES TO SERVE THE PUBLIC IN TIMES WHEN AMATEUR RADIO IS NEEDED THE MOST. THANKS AGAIN.

LASTLY, THE PPRS BOOTH AT THE COMPUTER FAIRE WAS A GREAT SUCESS! WE ESTIMATE THAT WE TALKED TO OVER 2 THOUSAND PERSONS AND HAD AT LEAST TENS OF THOUSANDS PASS BY THE BOOTH AND EITHER BROWSE OR PICK UP LITERATURE. FOR FUTURE CONFERENCES I SUGGEST THAT THE ARRL HAVE ON HAND THOUSANDS OF INFO SHEETS ON #1. HOW TO BECOME A HAM RADIO OPERATOR. 2. WHAT IS HAM RADIO. #3. THE BASICS OF WHAT IS PACKET RADIO, #4. ADEQUATE COPIES OF AX.25 PROTOCOLS, #5. ADEQUATE COPIES OF THE PREVIOUS AND PRESENT ARRL COMPUTER NETWORKING CONFERENCES(AS YOU KNOW WE RAN OUT OF THE CONFERENCE PAPERS AND PROTOCOLS SATURDAY AFTERNOON. ALSO AS YOU PROBABLY KNOW, THERE WAS NO MENTION OF THE CONFERENCE IN MARCH QST, THE ISSUE WE ALL RECEIVE IMMEDIATELY PRIOR TO THE CONFERENCE (AT LEAST ON THE WEST COAST). THERE WERE MENTIONS OF OTHER EVENTS IN THE "CONTEST CORRAL", "SPECIAL EVENTS", OPERATING SCHEDULE, "CONVENTIONS", ETC BUT NOTHING ABOUT THE CONFERENCE. I AM MENTIONING THE ABOVE ONLY AS CONSTRUCTIVE CRITICISM IN THE HOPE WE CAN DO A BETTER JOB IN THE FUTURE, ALTHOUGH THAT SURE WILL BE HARD TO BEAT!

LAST ITEM IS A QUESTION. WHAT IS THE STATUS OF HF PACKET MAILBOXES? LEGALITY? UNATTENDED? CONTROLLED VIA UHF LINKS ? MONITORING (SELF)? IN OTHERWORDS, I WANT TO

KNOW THAT YOU ARE VERY BUSY AND APPRECIATE YOUR TIME. THANKS AGAIN. AS YOU KNOW PACKET SEEMS TO BE THE ~~BOG~~ EXCITING ACTIVITY NOWADAYS ON AMATEUR RADIO AND HAS THE GREATEST POTENTIAL TO SIGNIFICANTLY IMPROVE OUR ABILITY TO PROVIDE SERVICE TO OUR FELLOW MAN VIA AMATEUR RADIO. IT ALSO PROMISES TO PULL IN MANY YOUNG PEOPLE WHO THINK IT IS NEAT TO HOOK THEIR COMPUTERS UP VIA RADIO . IF I CAN BE OF SERVICE IN THIS RESPECT FROM MY END , PLEASE LET ME KNOW. MANY THANKS FOR ALL YOUR PIONEERING AND QUALITY HARD WORK , PAUL. HAVE A GREAT SPRING !

73,

DON SIMON, NI6A

PPRS- FREQ. COORDINATION CHAIRMAN
COMMUNICATIONS CHAIR. B/WCC AMERICAN RED CROSS
ARES/RACES/AMSAT/AMRAD/TAPR/QCWA

Doc. #21

REPORT OF
THE AD HOC COMMITTEE ON AMATEUR RADIO DIGITAL COMMUNICATION

The ARRL Fourth Amateur Radio Computer Networking Conference was held on March 30, 1985, at the Moscone Center, San Francisco. Twenty four technical papers (by 26 authors and co-authors) were preprinted in the proceedings, which ran 109 pages. Sales of these proceedings as of the end of June amounted to $5300. ARRL book sales at the booth exceeded $2400 (split between proceedings, Handbooks and Satellite Experimenter's Handbooks). The Conference was well attended -- an average of 100 seats filled all day.

The Committee met the following day. Present were:

Paul Rinaldo, W4RI (Chairman)
Terry Fox, WB4JFI
Jyle Johnson, WA7GXD
Wally Linstruth, WA6JPR
Doug Lockhart, VE7APU
Hank Magnuski, KA6M
Paul Newland, AD7I

Progress has been made on standardizing command and response protocols used between the operator's terminal and the terminal-node controller (TNC). At present, what the user types to command the TNC to do something and what the TNC says back to the operator are left to the designer of the TNC software. It is highly desirable to work toward a standard. The Committee reviewed a paper written by Doug Lockhart suggesting a new protocol written around CCITT X.3, X.28 and X.29 recommendations. There was wide acceptance of this approach. What remains is to rewrite the tutorial/proposal paper into specification language and circulate it for approval of Committee members.

Some progress has been made in developing network protocols. However, it should be recognized that this development is still in its gestation (if not "chicken-and-egg") period and that a number of preliminary steps had to be taken before network experimentation could start. First, the Xerox 820 board which was selected for networking experiments needed an external input/output board; the Florida Amateur Digital Communications Association (FADCA) designed the FADboard, and Tucson Amateur Packet Radio Corporation (TAPR) produced 100 boards. Second, we needed software to run multiple virtual connections at the AX.25 link layer; Phil Karn, KA9Q, Harold Price, NK6K, Howie Goldstein, N2WX, and Jon Bloom, KE3Z, have written versions for several types of TNCs -- all are in the debugging stage now. Third, Doug

Lockhart, VE7APU, reports that he has written a networking program that will permit experimentation with explicit routing of packets; his network layer sits on top of his V2 link-layer protocol. The amount of rewriting to adapt it to AX.25 has not yet been determined.

As an interim measure, software was written to turn a Xerox 820 into a dual-port digipeater. This allows a single digipeater to serve two different frequencies and to selectively route packets between these frequencies. When networking software is written, it can simply replace the dual-port digipeater software and use the same hardware.

Successful networking depends on the availability of higher-speed modems. The 9600-baud modem designed by Steve Goode, K9NG, has just completed extensive testing. TAPR is producing printed-circuit boards which are to be available this fall.

At its March, 1985 meeting, the Committee recommended that "AX.25" be registered. With the concurrence of President Price, Counsel Imlay submitted the necessary application for a Service Mark to the Patents and Trademarks Office on June 20, 1985.

Several Committee members provided thoughtful comments on PR Docket No. 85-105 (RM-4879) in the matter of permitting automatic control of Amateur Radio stations.

At its November 1984 meeting, the Committee prepared a number of suggestions that Amateur Radio equipment manufacturers could adopt to facilitate packet radio. A paper outlining the Committee's ideas was forwarded to industry on July 11. Late word is that the Japanese Amateur Radio manufacturers are currently holding meetings on how to get into digital communications. One specifically mentioned incorporating AX.25.

Tentative plans had been made for a Committee meeting in Newington on August 3-4. The meeting will be delayed until about October to allow individuals to get some additional work done, and to detail a long list of network- and transport-layer technical issues that need to be addressed at the meeting.

The Committee has proposed Orlando as the site for the Fifth ARRL Amateur Radio Computer Networking Conference in early 1986. Director Butler has agreed to introduce a motion requesting Board approval of this League-sponsored event.

Respectfully submitted,

Paul L. Rinaldo

Paul L. Rinaldo, W4RI
Chairman

April 12, 1985

To : Ad Hoc Committee on Amateur Radio Digital Communication
From : Chairman
Subject: PR Docket No. 85-105, RM-4879

Here is an advance copy of the FCC NPRM to amend Part 97 of the Rules to permit automatic control of Amateur Radio stations.

In just reading it quickly, it looks like the FCC went considerably beyond the ARRL petition by proposing to authorize automatic operation for any amateur operation above 29.5 MHz. Also, note that while citing the desirability Computer Based Message Systems, the FCC would require a control operator present for all third-party traffic. Wouldn't that defeat the purpose of CBMSs? It is possible that the FCC drafter was thinking only of voice third-party traffic, although that's just speculation on my part.

Please look it over and let me have your inputs ASAP.

Dave

Paul L. Rinaldo

Before the
Federal Communications Commission
Washington, D.C. 20554

PR
FCC 85-169
35723

In the Matter of

Amendment of Part 97 of the Commission's Rules to permit automatic control of amateur radio stations.

PR Docket No. 85-105
RM-4879

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Adopted: April 5, 1985 Released: April 11, 1985

By the Commission:

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1/ The ARRL said that it was not requesting automatic control for frequencies below 30 MHz (HF frequencies) because heavy frequency usage below 30 MHz made manual control of digital communications on those frequencies more appropriate.

which is both feasible and necessary to facilitate further development in the art of amateur radio. Two timely comments were filed. Both supported the petition for rule making.

3. *Automatic control in the Amateur Radio Service has previously been* approved for repeater, auxiliary links and beacon operations.2/ With an ever-growing list of amateur operations where automatic control is permitted, we believe that now may be the appropriate time to expand automatic control to all amateur operations, prohibiting its use only in those situations where there is a justifiable reason why automatic control should not be allowed. Therefore, we invite amateur radio operators in general, and amateurs experienced in automatic control in particular, to submit comments calling to our attention any problems that may arise by expanding automatic control to encompass all amateur radio operations. Our goal is to keep the amateur service abreast of technological developments and to utilize new technology, such as CBMS, where appropriate. On the other hand, we do not want to introduce any innovations into the service which would be disruptive of amateur communications or which would essentially change the character of the service.

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3/ See also News Release, Report No. 2028, Mimeo No. 8832, October 25, 1978.

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8. In accordance with Section 1.419 of the Commission's Rules, 47 CFR 1.419, formal participants must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. Each set of comments must state on its face the proceeding to which it relates (PR Docket Number) and should be submitted to: The Secretary, Federal Communications Commission, Washington, D.C. 20554. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C.

9. In accordance with Section 605 of the Regulatory Flexibility Act of 1980 (5 U.S.C. 605), the Commission certifies that these rules would not, if promulgated, have a significant economic impact on a substantial number of small entities because these entities may not use the Amateur Radio Service for commercial radiocommunication (see 47 CFR 97.3 (b)). In addition, the proposed rules concerning expansion of automatic control in the Amateur Radio Service would not significantly impact on the manufacturers of amateur radio equipment since devices installed to secure the radio equipment from unauthorized use or to detect transmitter malfunction are not usually purchased from such manufacturers.

10. In view of the foregoing, rule making petition RM-4879 filed by the ARRL IS GRANTED.

11. IT IS ORDERED, That the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and the Secretary shall also cause a copy of this Notice to be published in the Federal Register.

12. For information concerning this proceeding, contact Maurice J. DePont, Federal Communications Commission, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachment: Appendix

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations would be amended, as follows:

1. Section 97.3 (m) (3) would be amended to read:

§ 97.3 Definitions.

* * * * *

(m) * * *

(1) * * *

(2) * * *

(3) Automatic control means the use of devices and procedures for control of an amateur station without the control operator being present at the control point.

2. Section 97.79 (b) would be amended to read:

§ 97.79 Control operator requirements.

* * * * *

(b) Every amateur radio station, when transmitting, must have a control operator. The control operator must be present at the control point of the station, except when the station is transmitting under automatic control. The control operator must be a licensed amateur radio operator or permittee designated by the station licensee. The control operator and the station licensee are both responsible for the proper operation of the station. For purposes of enforcement of the rules of this part, the FCC will presume that the station licensee is the control operator of the station, unless documentation exists to the contrary.

3. A new section 97.80 would be added, as follows:

§ 97.80 Operation under automatic control.

(a) An amateur radio station may be operated under automatic control:

(1) when in beacon operation on frequencies 28.20-28.30 MHz; and

(2) when transmitting on frequencies above 29.5 MHz, except when in beacon operation on:

MHz	MHz
50.00-50.06	220.06-222.05
50.08-54.0	222.06-225.00
144.00-144.05	420.00-432.07
144.06-148.00	432.08-450.00
220.00-220.05	

(b) When under automatic control, devices must be installed and procedures must be implemented which will ensure compliance with the rules when the control operator is not present at the control point of the station.

(c) No amateur radio station may be operated under automatic control while transmitting third-party traffic.

(d) Automatic control of a station must cease upon notification by the Engineer-in-Charge of a Commission field office that the station is transmitting improperly or causing harmful interference to other stations. Automatic operation must not be resumed without prior approval of the Engineer-in-Charge.

4. Section 97.85 (e) would be deleted. Paragraphs (f), (g) and (h) would be redesignated as paragraphs (e), (f) and (g), respectively.

5. Section 97.86 (a) would be deleted. Paragraphs (b), (c) and (d) would be redesignated as paragraphs (a), (b) and (c), respectively.

6. Section 97.87 (b) and (c) would be deleted. Paragraph (d) would be redesignated as paragraph (b) and pargraph (e) would be redesignated as paragraph (c). In redesignated paragraph (b), the last sentence would be amended to read: "In such cases, the rules of 97.85 (e) (1) (2) and (3) apply." A new paragraph (d) would be added to Section 97.87 to read, as follows:

(d) Beacons under automatic control transmitting below 432.08 MHz are restricted to the following emissions: NØN, A1A, F1B and J2A.

7. Section 97.114 would be amended by adding a new paragraph (d) as follows:

§ 97.114 Limitations on third-party traffic.

* * * * *

(d) Third-party traffic from any amateur radio station under automatic control.

N16A

THE AMERICAN RADIO RELAY LEAGUE, INC.

• SECTION TRAFFIC MANAGER

LEADERSHIP OFFICIAL

Section Traffic Manager: East Bay

DONALD SIMON
2327 Alva Avenue
El Cerrito, CA 94530
415-237-1381

QST
OFFICIAL JOURNAL

4-11-85

HANK MAGNUSKI KA6M

DEAR HANK-

I HAVE A MEETING WITH KX1B AND K1CE OF THE ARRL IN FRESNO ON THIS THURSDAY EVENING AND FRIDAY MORNING SO WILL NOT BE AT THE BOARD MEETING. WOULD APPRECIATE YOU INFORMING ME OF ANY ITEMS THAT SHOULD HAVE MY ATTENTION (from the PPRS Board meeting).

IF YOU WOULD , THE FOLLOWING ITEMS SHOULD BE BROUGHT TO THE BOARD's ATTENTION:

1. NARC WILL RULE ON THE 220.95 MHZ FREQ ALLOCATION AT ITS NEXT BOARD MEETING 3 MONTHS FROM NOW. THE NARC MEETING IN APRIL IS A GENERAL MEETING AND WILL NOT DISCUSS BAND PLANS.

2. NEW DIGIPEATERS UP AT 3200' OVER SANTA BARBARA IS KA6SOX-1 . IT COVERS INTO SAN DIEGO BUT IS SHADED TO MUCH OF LA. NK6K-1 AT 1500' IN PALOS VERDES- WA6FSP-1 145.03 1000 ft at MELCHER HILL- W6B XN IS NOW OPERATIONAL-

3. IT IS MY VIEW THAT WE NEED TO OUTFIT DIGIPEATER SITES IF A GROUP NEEDS EQUIPMENT BUT HAS A SITE. A FUND CAN BE INSTITUTED BASED ON DONATIONS OF MONEY AND EQUIPMENT?

4. FOR TRAFFIC AND EMERGENCY WORK QUICK AND EASY MAILBOXES MUST BE ALLOWED ON THE LINK FREQUENCY. I WOULD OPPOSE ANY MOTION THAT WOULD ELIMINATE ALL MAILBOXES (OR ATTEMPT TO) FROM 145.01 UNTIL THE 220 LINKS ARE INSTALLED.

THANKS HANK - I AM INTERESTED IN THE X.400 STUFF IN REGARDS TO THIRD PARTY TRAFFIC. WE ROUTE TRAFFIC EVERYDAY TO(DESTINATION) , FROM (SOURCE) WITH STANDARD ROUTINGS AND HEADINGS. IT IS RATHER PRIMITIVE BUT MAY BE OF SOME USE OF COURSE WE USE AR TO SEPARATE ONE MESSAGE FROM THE OTHER. BT TO SEPARATE PARTS - ROUTINGS ARE DONE BY DIVIDING THE COUNTRY INTO 3 AREAS (PACIFIC, CENTRAL, AND EAST) AND TWELVE REGIONS AND 73 ARRL SECTIONS . THUS PALO ALTO IS PACIFIC AREA . THEN TRAFFIC GOES TO 6 REGION NET, AND FROM THERE TO NORTHERN CALIFORNIA NET FOR DELIVERY. THEREFORE PALO ALTO TRAFFIC IS ROUTED P6NCN- EVERY CITY IN THE COUNTRY IS COVERED USING THIS METHOD. A SIMILAR SYSTEM MAY WORK FOR PACKET AS WELL? THE ONLY THING THAT MAY CHANGE ARE THE FURTHER FRAGMENTATION INTO LOCAL AREA NETS AFTER SECTION NETS. AT THE SECTION NET LEVEL ROUTINGS COULD BE DONE BY ROUTING TABLES. ANYWAY, I HOPE THIS MAY BE OF HELP. LET ME KNOW ABOUT DR NET (HOW TO GET ON BOARD?) AND ALSO ENCLOSED IS DCAC ARTICLE, LET ME KNOW IF ITS OK . THANKS .

BEEN SNOWED LATELY WITH THE RED CROSS, ARES, AND TRAFFIC RESPONSABILITIES AS WELL AS NEW APPOINTMENT TO BLOODBANK EMERGENCY COMMUNICATIONS ADVISORY COMMITEE, SO WILL HANG IN THERE AS LONG AS I CAN TO HELP. 73 + Thanks!

don N16A

Don

P.S. Enclosed is mailing to PPRS gang for Westnet - I will mail rest later

I assume you have a copy of NK6K's "Report" for DR NET so won't enclose it here

PR

THE ARRL Letter

Volume 4, Number 8

April 11, 1985

ARRL Says NO to Cable Leakage Increase

On March 29, the ARRL filed its comments in opposition to Mass Media Docket 85-38, the cable TV deregulation docket. This proposal, if adopted, would delete quality performance standards for cable television systems and increase permissible signal leakage levels in the 54-216 MHz band. The League's comments stated, in part, that an increase in signal leakage levels sends the wrong message to those cable companies that are not complying with the present rules. ARRL compares U.S. CATV signal leakage limitations to the Canadian limitations. On the frequencies between 108 and 174 MHz, the Canadian limitation is **half** the present limitation in the U.S. "Unique to the Canadian standards is the requirement that a technical brief be submitted proving overall RF integrity of a system proposing to expand, redesign, or extensively change a cable system."

League comments continue, "In sum, it would appear that the proposed increase in maximum cable signal leakage levels is unnecessary to well-engineered, well-maintained systems...Only those systems which exhibit leakage levels in excess of presently permitted leakage maxima would be rewarded for their failure to adequately maintain their systems by legalization of existing Rule violations."

ARRL is on record with a Petition requesting that the FCC ban cable TV operation on amateur frequencies (RM-4040). In dismissing this petition, FCC placed great faith in the success of joint ARRL/NCTA (National Cable Television Association) efforts to cooperatively resolve interference problems. ARRL comments in Docket 85-38 stated, "While joint ARRL/NCTA engineering efforts are ongoing, there has been effectively <u>no</u> success in resolving interference problems submitted by the ARRL to NCTA for review and assistance... Of 37 cases referred to NCTA only one has been resolved, and 29 complainants have indicated no abatement in cable signal egress interference; the remaining 7 complainants could not be contacted. In addition to these cases, the League has received 40 other unresolved complaints since July of 1984. The League's Technical Department receives between 4 and 10 communications <u>weekly</u> from amateurs requesting technical assistance on behalf of cable subscribers in connection with signal ingress interference problems. Given this level of interference problems, and the notable lack of success in resolving troublesome cases, even with NCTA's assistance, it is unfathomable that at the same time the maximum cable signal leakage levels should be increased beyond that which is already incompatible in residential areas."

The ARRL comments also take exception to the Commission's comparison of cable leakage to radiation from devices covered under Part 15, such as computers. While computers may be switched off, cable leakage is constant. Computers are also "point source" radiators, while any RF that escapes from the coaxial cable may use the entire conductor as an antenna.

Also included with ARRL comments is a four-page engineering report discussing the interference effects of cable leakage on Amateur Radio VHF-FM communications in residential areas.

Copies of the ARRL comments in this proceeding are available from Hq. for a large s.a.s.e. with 56 cents postage affixed. Reply comments are due by April 15.

BARRY GOES TO BAT -- AGAIN

FCC Chairman Fowler and his Bureau Chiefs went before the Senate Subcommittee on Communications on Wednesday March 20 for a hearing on the Authorization Bill for 1986 and 1987. Senator Barry Goldwater, K7UGA, was in the Chair. Senator Danforth, Chairman of the parent Commerce Committee, and Senators Ford, Gore and Hollings also took part in the hearing at various times.

Goldwater fans will enjoy his opening statement delivered precisely at the appointed hour of 9:30:

"The Committee will come to order. I think I should explain that when I am conducting meetings, I start on time. We do not need a quorum present to start a meeting. We need a quorum only to pass legislation, and we have got enough to do without waiting around for people to show up. . . ."

There were no real fireworks in the hearing, but Senators Ford and Hollings asked pointed questions about the proposed swaps of channel assignments between educational VHF TV and commercial UHF TV stations. Senator Goldwater predictably came up with a few amateur matters:

"I have been interested in the rulemaking [Mass Media Docket 85-38] which proposes to permit cable systems to leak more of their signal into the air waves. Am I correct in believing that no change is proposed to the second half of the present governing scheme? That is, regardless of whether any leakage is above or below the minimum standards, the cable operator is in all cases responsible for eliminating any interference to communications caused by the leakage. . . either way?" Chairman Fowler's answer: "Absolutely!"

They went on to discuss Senate Bill 66, the Senator's measure to make intentional interference a statutory offense, which Fowler said the Commission totally supports. K7UGA also complimented the Commission on its RFI booklet:

"I would strongly propose that you give further public notice to the excellent printed matter you have on interference. It is by far the best ever written, and it will avoid, I think, a lot of court cases, a lot of cut antenna wires and all sorts of things."

NEW 40 METER PHONE FREQUENCIES IN THE CARIBBEAN?

FCC-licensed amateurs outside the 48 contiguous states may soon be authorized to use phone in the frequency segment 7075 to 7100 kHz. Regular readers of the ARRL Letter will remember the petition, filed last November by KP4AM, that requested the FCC authorize phone on 7075 to 7100 in the Caribbean. Amateurs in Alaska and Hawaii have already been authorized phone privileges in this segment by the Second Report and Order in Docket 82-83, released July 31, 1984. Now, the FCC has released a Notice of Proposed Rulemaking in Docket 85-104. The FCC proposes to amend Section 97.61 to authorize use of the frequency segment 7075 to 7100 kHz by amateur stations transmitting from any location other than the 48 contiguous states.

In his request for these phone privileges, David Novoa (KP4AM) argued that the Caribbean is now the only area outside the continental U.S. under U.S. jurisdiction where U.S. amateurs may not operate phone in the 7075 to 7100 kHz segment. Novoa also claimed that interference from broadcast stations makes the band segment above 7100 kHz almost useless, especially at night. Novoa argued that the use of this frequency segment in the Caribbean would promote international goodwill, and would not cause detrimental interference to CW operators in the continental U.S. because of the limited number of potential users.

The Commission received nine comments on the petition, all in support of the request. Many commenters agreed that U.S. amateur phone privileges in the proposed segment would promote international goodwill.

In response to the Petition, and the comments discussed above, the Commission proposes to amend Section 97.61 paragraph 1 limitation 1 to read "The use of A3E and F3E in this band is limited to amateur radio stations transmitting from any location other than the forty-eight contiguous states." The Puerto Rico Amateur Radio Club suggested limiting the privileges to Advanced and Extra Class licensees. The FCC would like comments on this suggestion. Comments in this proceeding are due by June 17, 1985, replies by July 17. Formal comment requires the filing of an original and five copies, but a single copy will be considered informally.

FCC-LICENSED BROADCAST STATIONS AUTHORIZED 40 METER FREQUENCIES IN THE PACIFIC

In another 40 meter development, the FCC has issued a Report and Order authorizing the use of the frequency segment 7100-7300 kHz by **broadcast stations** licensed by the FCC in the Pacific outside ITU Region 2. ITU Region 2 contains North America, South America and Greenland. The Report and Order closes the book on Mass Media Docket 84-706.

The ARRL filed comments in opposition to this proposal, citing possible interference to amateurs in Region 2, and suggesting that it might be more appropriate to specify hours of frequency use rather than the Commission proposal to limit the radiation patterns of broadcast stations in the Pacific. Far East Broadcasting replied that this would open the way for other international broadcasters not licensed by the FCC to occupy the frequencies during the "quiet periods."

The Commission worked out a compromise in the Report and Order. The new rule has two parts. First, none of the affected stations may operate at any time with antennas oriented toward Region 2. Second, during the hours of 0800 to 1600 UTC, radiation in any easterly direction that would intersect any area in Region 2 shall be limited to at least 12 dB below the the maximum radiation in the major lobe for antennas with gains greater than 15 dB and at least 6 dB below the maximum radiation in the major lobe for antennas with gains of 15 dB or less. ARRL staff is studying the rule to determine just how much protection it will actually afford.

ARRL REQUESTS EXTENSION IN REPEATER DOCKET

The League has filed for an extension of time to file comments in the repeater coordination Docket, PR Docket 85-22. The ARRL request states that the Board of Directors will be receiving substantial input from amateur constituents on this issue, and the League cannot prepare substantial, thoughtful Comments which reflect the overall needs of its membership and the amateur community without an in-person meeting of the Board to formulate policy. The next meeting of the ARRL Board of Directors is scheduled for July 25 and 26, after the present comment deadline. The ARRL therefore requests an extension of 45 days, to and including August 15, 1985, in which Comments may be filed in this proceeding.

FCC PROPOSES AUTOMATIC CONTROL FOR AMATEUR STATIONS ABOVE 30 MHZ

Responding to a Petition filed by the ARRL seeking automatic control for digital communications above 30 MHz, the Commission has proposed to allow automatic control for all amateur operations above 29.7 MHz. 5

A news release dated April 10 describes the NPRM (Notice of Proposed Rulemaking) in PR Docket 85-105, in which the FCC states that this may be the appropriate time to expand automatic control operations in order to utilize new technology, such as Computer Based Message Systems.

This FCC preliminary news release does not go into detail. We will have to wait until the NPRM is released for the details and the comment deadlines.

WANT TO KNOW MORE ABOUT OSCAR? TRY THE TELECONFERENCE RADIO NET JUNE 14th.

The next North American Teleconference Radio Net (TRN), on June 14, will review new and exciting developments in the Amateur Radio space program. Basic information on how you can get started in satellite communications will be provided. Some of the topics to be covered include:

*How can satellites be used to QSO?
*How can you get started?
*How are the amateur satellites built and launched?
*What kind of activities are planned for the future in the amateur space program?

These questions, and any others you may have, will be addressed in the teleconference. AMSAT, the Amateur Satellite Corporation, will have some of its top volunteers available on the teleconference:

*John Browning, W6SP
*Vern "Rip" Riportella, WA2LOQ
*Tom Clark, W3IWI
*John Champa, K8OCL
*Bill Tynan, W3XO

If you have been trying to get started in satellites because you're frustrated with present HF band conditions, now's your chance to get some help. Don't miss this opportunity to learn more about the fantastic activities in the works in the amateur space program. For more information on the Teleconference Radio Net, contact Timothy Lowenstein, WAØIVW, Net Manager, c/o Midway ARC, P.O. Box 1231, Kearney, NE, 68847-1231.

FIRST, THE "GOLDEN SPIKE" -- NOW, THE "GOLDEN PACKET"

Packet enthusiasts, listen up! Do you want to win a one-of-a-kind award for pioneering work in packet radio? To encourage the completion of the first terrestrial transcontinental packet network link, the Pacific Packet Radio Society has established a unique award for participants in the transcontinental link. The award will be known as the "Golden Packet" award, and will consist of either a plaque or certificate for all participating stations. The system used for the transcontinental link must consist of fixed terrestrial digital store-and-forward radio links using VHF (greater than 144.1 MHz), UHF or microwave frequencies. Use of HF, satellite, tropo, meteor scatter or moonbounce is prohibited.

For more information on the award, and the regulations relating to it, contact the Pacific Packet Radio Society, P.O. Box 51562, Palo Alto, CA 94303.

ARRL NOVEMBER SWEEPSTAKES RESULTS

Affiliated Club Competition

Unlimited category	
Northern California Contest Club	7,607,843
Mad River Radio Club	5,465,897
Medium category	
Texas DX Society	5,531,704
North Texas Contest Club	4,865,122
Potomac Valley Radio Club	3,585,098
Colorado Contest Conspiracy	3,437,724
Yankee Clipper Contest Club	2,748,671
Local category	
Rubber Circle Contest Club	1,309,170
Kansas City DX Club	925,202
Eastern Iowa DX Association	880,346
Central Arizona DX Association	794,994
Dixie DXers	766,622

Complete results will appear in May QST.

SHUTTLE NEWS -- SOME GOOD, SOME BAD

We have received some good news, and some bad news, from NASA concerning the next "Ham in Space" mission.

The bad news is that it will not be possible to complete, in time for the mission, the Shuttle modifications that would have permitted antennas to be mounted in the cargo bay. This means that it will not be possible to use a 28 MHz downlink as previously planned.

The good news is that plans are moving forward for Tony England, WØORE, to operate on 2 meters using the same window mounted antenna that was used by W5LFL in December 1983.

Tony's mission is designated 51-F, and the launch is presently planned for July 15, although that date, like all Shuttle launch dates, is subject to change. It is scheduled to last seven days, and because of other mission requirements it probably will not be possible for the Amateur Radio antenna to be used until midway through the third day. Accordingly, Tony's operating time will be more limited than Owen's and it is unlikely that there will be much opportunity for random contacts. The focus will be on making contacts with youth groups through Amateur Radio clubs and other groups who want to assist in exposing young people to this exciting aspect of Amateur Radio and the nation's space program. In addition, time will be devoted to experimental transmissions of slow-scan television from the spacecraft, to test this mode as a possible backup to NASA's own video links.

We are still awaiting formal confirmation from NASA, but it is not too early to start thinking about how you will tune into the next radio amateur in space!

20 KHZ WAY DOWN SOUTH IN DIXIE

Alabama has recoordinated all 2 meter repeaters in that state to 20 kHz spacing. Implementation will take place by July 1. William Matthews, WA4ZVJ, of the Alabama VHF-UHF Council, told the ARRL Letter that the decision was reached in a March 2nd meeting of the Council. Four of the 103 repeaters in Alabama could not be reassigned to a frequency pair under the new band plan, and these repeaters will have to wait for new pairs when they become available. Matthews said that the Council decided that Alabama should lead the area in implementing 20 kHz spacing.

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SOME THOUGHTS ON THE PRESENT AND FUTURE OF PACKET RADIO
IN THE MID-ATLANTIC AREA

Tom Clark W3IWI
27 May 1985

A. Introduction:

There has been a lot of discussion the past few months on how we should develop our packet radio networks in the future and here are some of my ideas. First let us begin by listing the a priori knowledge that we have:

(1) Packet radio is experiencing an explosive growth. In each of our local areas in MAPRC (Balto/Wash, Philly/Trenton/SNJ, Harrisburg/York, etc.) we are seeing several new users pop up each week. The recent entry of Heath and Kantronics into the commercial market (complete with unprecedented ad campaigns), plus TAPR's TNC2, plus the series of articles that are to appear in QST this summer will all act like a magnet. In May alone, nearly 100 users have logged into the 'IWI BBS at least once.

(2) Our present networks DO work. The BBS's are serving a communications need for non-real-time electronic mail (EM) between individuals, as a focal-point for public discussions ("electronic meetings") and as a way for users to get help. They are serving as our publishing channel (why spend $0.22 to mail this to you when I can post it by radio?) so that the MAPRC confederation hasn't felt the need to start a "paper" newsletter. Assuming that such communications must extend past the coverage area of any BBS and it's associated local area network (LAN), these communications functions REQUIRE linking.

(3) Individual users want to have real-time links available to them too, whether for "conventional" QSO's or for computer-to-computer connections. Some users must use a part of the linking network just to gain access to the local BBS (e.g. the Virginia folks to use 'IWI or '3Q BBS or APR-5 HF Gateway). A growing number of users from further away want to use the linking "trunks" to access BBS's outside their LAN (the BBS DXing syndrome!). Some of the more technical types want to use the links to test advanced networking concepts before they are made "public".

(4) The "community" resources which we all enjoy were, for the most part, installed by individuals and their ultimate control lies with PEOPLE. There has been precious little community (read that to mean you all) resources (read that to mean money, hardware, digipeater sites, etc.) applied to develop the networks.

(5) Technology is rapidly improving -- K9NG has developed 9600 baud modems which will be available soon. TNC2 is already a reality, albeit still in a "beta" testing mode. AX.25 Rev.2 code which will fix some "bugs" is near at hand (it is already available in TNC2 and KA9Q X820 code). Rudimentary Level 3 (networking) software is running between the BBS's and certainly will be available for more general use within a year. WORLI and his network of linked BBS's continues to enhance their capabilities daily. KE3Z has developed dual-ported digipeater code.

(6) One of our most valuable resources are the frequencies we use. Most of the activity is in the 145.01-145.09 range since radio hardware

legitimate network activities. INDIVIDUAL USERS AND NETWORKS "TRUNKS" CANNOT COEXIST!!

In the evolution of our system, the network should serve to interconnect the LANs, and the BBS's (or other gateway stations) provide the user interface into the network. INDIVIDUAL UJm!=UcNOT ACCESS THE NETWORK "TRUNKS" DIRECTLY.

Our present networks are fragile and easily broken. If WB2RVX points his beam north to access WA2SNA, then access thru Mike from APR-6 is marginal; and Mike is an experimenter at heart -- sometimes his station is doing other things. A single-point failure at a key site causes us to lose everything. The present bastardized network using dumb digipeaters requires end-to-end acknowledgements. Let us assume that a station has a 90% probability that a given packet will get to the next station, and a 90% probability of receiving the ack back. Then .9*.9 of his packets = 81% of his packets will make it thru (with ack) on the first try, and he will have to retry once out of 5 transmissions. This presents no serious problem other than the fact that 19% of the channel time is being wasted. However if 7 hops were needed, then the thruput goes down to 0.9^14 = 22.9% and only one packet out of 5 makes it the first time! The result -- the channel is clogged and nothing works. The Level 3 development work is intended to remove the need for end-to-end acknowledgement. The BBS's right now do this Level 3 function now in their mail forwarding -- IWI does not attempt to connect with WORLI to get stuff to Boston, instead IWI passes the buck by sending it to WB2MNF, who then worries about the next hop up the coast.

The problem is aggravated if one of the key relay stations is situated in the midst of heavy LAN activity. Typical local users will be running small antennas and simply not hear the remote stations at all; the result is that LAN users on link frequencies kill the link! INDIVIDUAL USERS SHOULD NOT BE ON LINKING FREQUENCIES!

At present, all we have is .01 (and HF) for linking. The same frequency is used by users and network gateways. Users also need to access the network directly since they do not have direct access to the gateways. The solution seems to me to be to build a second, redundant network in parallel on different frequencies. This second network should run the highest possible speeds consistent with reliability and affordability. Right now, the winner seems to me to be the K9NG 9600 baud design. Hopefully boards will be available soon. To go along with these modems, we need to begging implementing multi- (or at least dual-) ported digipeaters; the KE3Z design based on the venerable X820 board seems to be the logical choice. And we need to establish a source of good, reliable radios and antennas. It appears that 220 is the best choice, even considering that 220 is new "turf" for many of us, and that hardware is harder to find, and that the FCC might choose to cave in to the commercial interests and pull the band out from under us. If not 220, then the next place we have to go is 1270, and that will probably be even a tougher nut to crack since even less hardware is now available.

The 2M links on .01 should be maintained. For now it is all we have. When the higher speed links are in place, .01 can serve as an independent backup. And .01 can be the frequency for individual users to gain access to the longer-haul links for their own purposes.

D. A Plague on BBS DXing!:

As a special case of the problem just discussed, I want to cite a growing cancer in our midst -- BBS DXing!! The past couple of months have seen a large number of new users come on. The links have been improving with the addition of WA2SNA-2 in NNJ. Here I have seen a growing number of new users who seem to be unaware of the fragility of EASTNET. The will call in to IWI with 5-6 hop paths that look like (the call xxx is suppressed to protect the actual offenders from Bronx cheers!):

xxx <=> WA1IXU <=> KG1O-9 <=> WA2SNA-2 <=> WB2RVX <=> WB4APR-6 <=> W3IWI

Somehow, their one-way connect request packet arrives at IWI and with the AX.25 handshaking, the BBS send a connect ack and assumes that we are connected. It then tries to log the person on, and tries again, and again, and again until the BBS's timers say "Sorry Charlie" and hang up. Then xxx, having perhaps seen a packet or two coming thru from the BBS sez "Geez, this is nifty. I think I'll try again" and starts the whole cycle over again. In a 13 day sampling period in May, of 273 connections logged on the IWI BBS on 145.01, a total of 96 (=35%) ended with timeouts. INDIVIDUAL USERS SHOULD NOT ACCESS BBS'S THRU MORE THAN 2-3 DIGIPEATERS!!! BBS's are there to serve LAN and network gateway functions -- BBS DXING SHOULD BE BANNED!! I am considering adopting the anti-social solution to this problem by putting those folks who show up in the "timeout" list onto the "banned user" list and invite comments on the acceptability of this approach.

E. Getting it all together:

The fragile system we now have was built by individuals as an experiment. It works! It paves the way for the future. The individuals cannot be expected to continue to provide ALL the hardware as a gratuity just 'cuz they are nice guys. The new wave of users who want the services will have to begin carrying their share of the load. The LAN BBS's and local coverage digipeaters are the logical province of local clubs and groups. The shared resource, to which all must contribute is the interconnecting network. Parts of the network are going to require WORK!!! New sites for key linking stations have to be acquired AND MAINTAINED. Special hardware -- high speed modems, multi-port digipeaters, radios, etc. -- all have to be built and paid for. And the whole network has to be coordinated. I envision the Mid-Atlantic Packet Radio Council -- MAPRC -- serving that coordination role. It remains to be seen if that role includes only technical coordination or if it also will include the financial/managerial functions too. I ask MAPRC to consider these ideas and begin forging packet radio's future destiny NOW. If we don't act now, then I feel that we are in danger of having uncontrolled chaos in the future.

C2974 CC7 Phil R. Karn (ka9q,2979) 5/30/85 1:05 AM L:90
KEYS:/THOUGHTS ON W3IWI'S THOUGHTS/

Here are a couple of (relatively minor) comments on Tom Clark's network notes.

1. Tom is indeed correct that users ought to "live" on local BB systems whenever possible, freeing the long haul links for mail (and file) transfer. This is in fact the mode the ARPA Internet tends to operate in, since it makes the long-haul network delay less painful to the individual user. It also makes more efficient use of long-haul resources to transfer mail in a host-to-host "batched" mode than for a user to log in remotely and read it interactively. Remote login DOES

occur, however, and it should not be precluded altogether. Any meaningful network should be capable of supporting a mixture of both, as long as people use it efficiently.

2. I have been a little bothered by the term "level 3" as it has been bandied about in the amateur packet radio community. As it is ordinarily used in networking, it applies to something we in fact already have, and that is our digipeater network. We even have a "level 4", which is the (so-called) "level 2 AX.25 protocol". Confused? That's why we ought to avoid the use of "level" numbers for the time being and talk instead in terms of relative functionalities. (One scholarly paper has a rather clever "N = N + 1" "proof" that results from the practice of assigning fixed, absolute level numbers to certain protocol modules).

As an aside, what some who have discussed backbone networks with more sophisticated protocols are really proposing is a "transport protocol conversion gateway" (PCG) which would convert between AX.25/LAPB (the upper "half" of AX.25, used between the end user and the gateway) and, say, TCP (used between the entrance and exit gateways in the backbone.)

AX.25 would also be used in the backbone net, but only as a true link layer protocol down below the backbone's network protocol, IP:

```
End UserProtocol gateway
TransportAX.25(LAPB) <--------->AX.25(LAPB) <=>TCP
NetworkAX.25(Digi) <--------->AX.25(Digi)IP
LinkHDLC    <--------->HDLCAX.25/HDLC
```

It would be the same AX.25 in both places, but their functions would be different. Layering is all relative; it all depends on what's above and below.

If the above chart appears needlessly complicated, you're right!

A far cleaner way to do things is to put TCP in the end-users' TNCs, where it belongs, and get rid of the protocol mapping/translating gateways. According to quite a bit of the literature, protocol mapping is a real pain in the ass, to be avoided whenever possible, especially when two connection-oriented protocols such as TCP and X.25 are involved. Their arguments are quite persuasive, and I think those who have already worked on this problem for amateur radio are fast encountering the same problems. (Lest anybody object to the space needed to implement TCP, I can point out that it's been done in 6K at MIT on an IBM PC.)

This is what we should have done from the beginning, i.e., to first concentrate our efforts on a good end-to-end transport level protocol and then work DOWNWARDS, e.g., by adding link level acks as a performance enhancement to a skeletal link level protocol. As it is, we've got a real kludge going with AX.25 because we're using it as a transport protocol, and "doing it right" is going to involve some painful shuffling of protocol modules.

End of aside.

3. The "level 3 development work" will NOT eliminate the need for end-to-end acknowledgements! They are still needed to guarantee reliability. As I mentioned, the addition of hop-by-hop acknowledgments (as a performance enhancement) will occur as AX.25 is shoved back down

into its proper place (i.e., to a link layer protocol). However, a REAL transport protocol (e.g., TCP, or X.224 TP-1 to placate the VC folks) MUST replace the end-to-end acknowledgment functions formerly provided by AX.25 if you are at all concerned with reliability. The uucp-net suffers greatly from a lack of true end-to-end acknowledgments, and I'd hate to see us repeat their mistakes.

4. I hate to see packet radio fragmenting across multiple channels, with the attendant hassles in maintaining full interconnectivity. But I see no alternative as long as the traffic far outstrips our slow, wasteful modems.

I see no FUNDAMENTAL reason why individual users should not be on "linking" frequencies, other than loading. In fact, the more sites present on a given channel, the greater the possibilities for pathfinding. We only have to find ways to accomodate the increased traffic and to introduce backoff algorithms to keep the channels stable under heavy loading.

5. I certainly agree with the need for more formal, group-supported shared facilities. That's the only way this thing is going to grow into a usable network.

Phil Karn

Key <ENTER> to continue:
*** EOT ***
bk

May 29, 1985

To : Ad Hoc Committee on Amateur Radio Digital Communication

Subject: Fifth ARRL Amateur Radio Computer Networking Conference

At our meeting in San Francisco, the Committee members (and observers) proposed that the Fifth Conference be in Florida and expressed a preference for Orlando (over Miami). This message was carried back to Florida by Gwyn Reedy. I heard that there were mixed reactions Florida by FADCA and other interested parties in Florida, and that the selection between Miami and Orlando was controversial.

Being unsuited for battle, I suggested that Gwyn, Director Frank Butler and everyone else in Florida work it out and let me know the outcome.

Today, I received the following from Gwyn:

"I have discussed the 5th Computer conference with Frank Butler and the Miami crew, and made a commitment to go with Miami (Feb 8, 9) subject to your approval and the BOD. Miami will be using a new facility this year and that overcomes my major objection to using that site."

Accordingly, the plan is for Director Butler to introduce a motion to this effect at the July 1985 ARRL Board Meeting. I will assume that this has Committee approval unless I hear in the negative from five or more members.

Dave

Paul L. Rinaldo, W4RI
Chairman

May 24, 1985

To : Members, ARRL Ad Hoc Committee
on Amateur Radio Digital Communication

Subject: FCC Tidbit on Automatic Control

Perry Williams picked up this bit of philosophy from the Private Radio Bureau on automatic control of electronic "mailboxes": Since a message stored in a mailbox is originated by one amateur and is retrieved by a second, third-party traffic may not be involved. Morever, this mailbox traffic may not even constitute "automatic control" of the digipeater, since it is uploaded under the control of one operator and downloaded by another control operator.

I'm sure that you can see some confusion in this. And, I don't see any point in passing this interpretation any further, particularly around the electronic-mail circuit. However, I thought you'd like a glimpse into the thinking going on inside PRB. What we think it says is that PRB wants to be liberal on this sort of thing. Also, it is pretty clear that they wanted to go the League one better on the automatic control petition.

My working hypothesis is that the FCC wants to be forward leaning but that it is having some trouble putting their feelings into regulatory language that hams will understand in the same way they do. We'll do what we can here to clear things up.

Paul

Paul L. Rinaldo, W4RI
Chairman

THE ARRL Letter

Volume 4, Number 11 May 23, 1985

ARRL Executive Committee Proposes New Novice Privileges

At its May 18 meeting, the ARRL Executive Committee approved a plan for enhanced privileges for Novice class Amateur Radio operators. The plan was developed by the Hq. staff in response to discussions held at the March 23 Executive Committee meeting. The proposal includes data and voice privileges on a portion of the 10 meter band, all data and voice privileges on 220 MHz, and voice and data privileges on a portion of the 1.2 GHz band.

The Executive Committee believes it is important for ARRL to be in the vanguard of efforts to modernize the Novice license. On a matter as important as this it is essential that the action be by the Board of Directors of the ARRL, and not just by the Executive Committee. Accordingly, Board endorsement of the proposal has been solicited by mail ballot.

The Executive Committee endorsed the following package:

1. Development of a plan to replace the existing worldwide network of 28-MHz beacons between 28.2 and 28.3 MHz with a single-frequency time-sharing network similar to the one that is being operated successfully on 14.1 MHz by the Northern California DX Foundation.

2. Expansion of the existing 28-MHz Novice band as follows:
A. 28.1-28.3 MHz: type A1A, J2A, F1B, and J2B emissions (CW and data, 1200 baud maximum).
B. 28.3-28.5 MHz: type A1A, J2A, and J3E emissions (CW and SSB).

3. 220-225 MHz, all voice and data modes (including CW), 25 watts output, no repeater operation by Novices (i.e., a Novice can operate through a repeater, but cannot sponsor one).

4. Privileges similar to those requested for 220 MHz, but for a portion of the 1240-MHz band consistent with the newly adopted band plan: e.g., 1246-1260 MHz. The power limit would be 5 watts output, to avoid concerns related to RF energy exposure by inexperienced persons.

The idea behind this plan is as follows:

1. To attract young people who are interested in computers and digital communication into Amateur Radio, we must offer them digital privileges. Adding RTTY and packet radio privileges on 10 meters would accomplish this. A suitable band plan can be developed for the band to keep a segment free for conventional, manual Morse code operation. Expanding the 10 meter Novice band, and permitting limited SSB operation, would have minimal impact on other licensees.

2. FCC has indicated that 220 MHz cannot be made available for Novice operation pending completion of a joint long-range study by FCC and NTIA of the 216-225 MHz spectrum. In the meantime, there should be some way found to give Novices some FM/repeater privileges so their numbers can be put to use in performing public service communications. The 1240 MHz band is suggested as the place where this could be accomplished with a minimum of delay, and a minimal disruption of existing operations.

3. At the time these new privileges are added, the Element 2 examination syllabus would be expanded to include basic digital and voice operating techniques. The Novice written examination would be expanded to 30 questions, and the question pool to 300, to accommodate the additional questions.

With these additional privileges, the Novice license would become most

(continued on page 2)

attractive to our target audience, without eliminating or even significantly reducing the incentives to upgrade to the higher classes of license and without disrupting the present activities of higher-class licensees. Technicians would also gain the 10 meter privileges granted to Novices.

So as not to reduce the privileges of General, Advanced and Extra Class licensees, the Executive Committee recommended that other licensees be permitted to use the higher power levels permitted by their class of license, even when operating in the Novice bands.

The ARRL Letter, QST and W1AW Bulletins will carry details on the proposal, as they develop.

In addition to enhanced Novice privileges, the EC discussed the following issues:

Dave Sumner, ARRL Executive Vice President, presented a feasibility study concerning ARRL issuance of special call signs. Ray Kowalski of the FCC joined the meeting to discuss the callsign matter from the Commission's perspective. A report will be made to the full Board in July.

The EC discussed Docket 85-22, the repeater coordination docket. The Executive Committee expressed a preference for mandatory coordination of repeaters; for open repeaters having priority over closed repeaters in the coordination process; and for regional coordination in preference to a national coordinator, whether it be an existing organization or an umbrella organization organized for the purpose. Hq. Staff was directed to continue preparation of draft comments on this docket; if the anticipated extension of time for filing comments materializes, the Board will have the opportunity to review the draft at its July meeting.

Docket 85-105, the automatic control proposal was discussed. ARRL comments will reaffirm the League's original proposal in RM-4879, emphasizing that it is desirable for automatic control to be available for third-party communications via digital modes above 29.5 MHz without the same relief to simplex autopatches.

ARRL will file comments in opposition to Docket 85-113, the proposal to allocate 421-430 MHz to the Land Mobile Service in three major cities (see the April 25 issue of the ARRL Letter). The EC believes the proposal is premature at best, since new blocks of spectrum in the 800 MHz range, recently made available to the Land Mobile Service, have not yet been occupied.

The League will file comments in support of the proposal that U.S. amateurs outside the 48 contiguous states (those in the Caribbean) be permitted to use phone in 7075-7100 kHz (PR Docket 85-104).

ARRL Development Manager Bill Lazzaro, N2CF, gave a progress report on the development program. Membership campaigns, youth programs, recruiting results and membership projections were among the topics.

A report on local antenna/RFI matters was presented by ARRL Counsel Chris Imlay, N3AKD. There was a brief progress report on the ARRL request for limited federal preemption of amateur antennas, PRB-1. FCC action on PRB-1 is expected in the next few months.

Great Lakes Division director George Wilson, W4OYI, presented a report on plans for the 1985 ARRL National Convention to be held in Louisville Kentucky, October 4-6.

ARRL Washington Area Coordinator Perry Williams, W1UED, presented a report on the proposed OSCAR 1 commemorative postage stamp. The stamp will again be considered by the Citizens Stamp Advisory Committee at its meeting July 26. The staff will seek support for the idea among prominent citizens in and out of the Government during the next two months.

The next regularly scheduled meeting of the EC will be held on August 24th in Scottsdale,Arizona. Complete minutes of the Executive Committee Meeting will appear in July QST.

FCC AMENDS ID RULE AGAIN

In January, the FCC editorially amended Section 97.121 of the amateur rules to clarify that the call sign of another amateur station could be transmitted in some cases — for example, when responding to a general call. David Popkin, W2CC, filed a petition for reconsideration with the FCC, and pointed out that by specifying the circumstances when an amateur station **may** transmit a call sign not assigned to it, the rule now implies that **all other use** of another call sign is unauthorized. The Commission agreed: by Order released May 1, the rule was changed again so it now specifies only that an amateur station must not transmit false or deceptive signals, nor for

purposes of identifying the station, any call sign which has not been assigned to it. The modifications made to this rule do not change the basic understanding that when one amateur is a guest at another's station, the control operator may simply use his or her own call sign to ID the operations.

SPREAD SPECTRUM OK FOR AMATEURS

The FCC has authorized spread-spectrum techniques in the Amateur Radio Service. The new rules will permit amateurs to develop, test and operate low-cost spread spectrum systems in the amateur bands above 420 MHz. The Commission said that by removing regulatory barriers to innovation, technical advances in radio technology can be stimulated.

The FCC action will permit amateurs to experiment with, and take advantage of this technology which until now has been almost entirely limited to military applications. The effective date of the new rules will be 12 months after the Report and Order is released. This delay is intended to encourage the amateur community to develop voluntary standards for spread spectrum, as the standards for packet radio were developed. In the interim period, special temporary authorizations will be available to interested amateurs.

In a spread-spectrum system, an information signal is combined with a much wider bandwidth, noise-like signal to yield a transmitted signal that is both broad band and noise-like. At the receiver, a copy of the original "noise" signal is used to derive the information signal. Because the energy of the transmitted signal is dispersed in the spreading process, it is less likely to cause interference in narrow-band receivers than a conventional signal of the same power. Spread spectrum systems were originally developed for military applications where covertness and jam resistance were the main goals.

The FCC said that while this proceeding (Docket 81-414) dealt with only the Amateur Service, the experience gained, especially on the subject of compatibility between spread spectrum systems and conventional narrow-band systems, will be a stimulus to the general radio technology community.

The Commission also approved a limited authorization (Docket 81-413) for spread spectrum use by the Public Safety and Industrial, Scientific and Medical (ISM) Services.

RAY KOWALSKI ON CERTIFICATES OF SUCCESSFUL COMPLETION

Ray Kowalski, Chief of the FCC Special Services Division, has responded to the League's request for clarification on the VE Program Certificate of Successful Completion. On March 15, ARRL Counsel Chris Imlay, N3AKD, wrote to Kowalski and asked him to clarify the FCC position on credit for written elements on amateur examinations.

Kowalski's letter states in part "The Commission's position is that a CSCE does not provide a basis for an applicant to take additional, higher-level written examination elements. Under the rules, only an FCC license would suffice. Rule 97.25 governs 'Examination credit' and it provides credit only for telegraphy examination elements 1(A), 1(B) and 1(C)."

Kowalski goes on to say that the FCC would entertain a formal proposal to change Section 97.25 of the rules to permit VEs and VECs to give credit for written examination elements to holders of appropriate Certificates of Successful Completion.

AT THE TONE, THE TIME WILL BE . . .

At the recommendation of the International Time Bureau, WWV will be correcting its time broadcasts on June 30. An extra second (or "leap second") will be inserted between 23:59:59 UTC and 00:00 UTC. This correction is necessary to maintain internationally coordinated time in close accuracy with astronomical time.

OSCAR 10 NOW COUNTS FOR SATELLITE DXCC

Contacts made via AMSAT-OSCAR 10 will now be accepted for the Satellite DXCC award. Credit is retroactive to the date OSCAR 10 first became available for contacts. The Satellite DXCC Certificate is a non-endorsable, one-time only award. Applicants must submit forms CD 164 and CD 253. Forms are available from ARRL Hq. for a business-sized s.a.s.e with 39 cents postage affixed.

BOOTLEGGER FINED $1500

FCC's Langhorne, Pennsylvania District office has fined Ronald Mondgock, of Yardley, Pa., $1500 for bootlegging on the Delaware Valley Radio Association's repeater. Assisted by local police, members of DVRA (based in Trenton, New Jersey) DFed Mondgock's house as the source of interference to their club repeater. They then notified the FCC Engineer-in-Charge, prompting official FCC involvement and action.

ASSISTANT DXCC MANAGER OPENING

The departure of Brian Downey, WA1KSF, from the ARRL Hq. staff creates an opening in the DXCC Branch for an Assistant Manager. Primary reponsibility is checking QSL cards and making proper DXCC record entries. Some processing of applications brought to Hq. "in person" is involved, as well as some routine correspondence and telephone inquiries. The Assistant Manager is responsible for manning the DXCC Desk in the absence of the Manager.

Applicants for this position should have a General class (or higher) Amateur Radio license. A high degree of accuracy and neatness in record keeping is essential. Some interest in DXing and knowledge of DX call signs helpful.

Anyone interested in this position should contact Don Search, W3AZD, DXCC Branch Manager, at ARRL Hq.

RADIO MARTI IS ON THE AIR!

Radio Marti, the controversial U.S. radio station beaming news and information programming to Cuba, went on the air this week. Radio Marti broadcasts in Spanish on 1180 kHz in the AM broadcast band.

AMATEUR RADIO CALL SIGNS

Amateur radio operators often ask the FCC what call signs have been assigned lately. This list shows the last call sign in each group to be assigned for each district, as of the first of May 1985.

For more information about call sign assignment in the Amateur Radio Service, see Section 97.51 of the FCC Rules, or write to the FCC, Consumer Assistance Branch, Gettysburg, PA 17325.

Radio District	Group A	Group B	Group C	Group D
	Am. Extra	Advanced	Tech/Gen	Novice
0	NJØX	KDØWM	NØGCE	KAØURF
1	KZ1L	KB1SG	N1DMQ	KA1MYF
2	NJ2R	KD2MK	N2FMO	KA2YGY
3	KV3S	KC3RS	N3EIK	KA3OBG
4	AA4IZ	KJ4DA	N4LYI	KB4OBT
5	NV5N	KE5ZP	N5HXS	KA5WAO
6	WG6J	KG6TC	N6LYA	KB6IRC
7	NN7D	KE7FS	N7HBX	KA7VKF
8	NM8F	KD8YB	N8GLG	KA8WNY
9	NE9J	KD9PB	N9FDS	KA9TOP

MALICIOUS INTERFERENCE BILL REINTRODUCED IN THE HOUSE

Representative Jim Bates, D-CA, has introduced a bill, HR-2479, into the House of Representatives which would make malicious interference a statutory offense. The text is very close to that used by Senator Barry Goldwater in his Senate bill, S-66.

Mr. Bates has secured the agreement of 13 other Representatives to co-sponsor the bill: Tim Wirth, D-CO; Jim Slattery, D-KS; W. J. Billy Tauzin, D-LA; Dan Coats, R-IN; Edward J. Markey, D-MA; Mickey Leland, D-TX; John Bryant, D-TX; Henry Waxman, D-CA; Carlos J. Moorhead, R-CA; Howard C. Neilson, R-UT; Denny Smith, R-OR; Bill Dannemeyer, R-CA and Nancy Johnson, R-CT. Other Members of Congress can add their names as co-sponsors at any time. ARRL Letter readers are welcome to suggest co-sponsorship to their Representative. There are two possible courses of action for the bill — hearings could be held on the bill itself, or it could be tacked on to some other communications bill in Congress.

WAYNE GREEN SAYS 73

Wayne Green, W2NSD, has resigned as editor of 73 Magazine, according to the May 17 issue of the Westlink Report.

Westlink reports that Green made the announcement at the Dayton Hamvention, saying "I have resigned as the editor of 73, and I did this because I really didn't want to continue writing editorials on how bad things are and I have no good news for you. We have some areas of Amateur Radio that are exciting and fun, but all you have to do is look around the room and see how many people came with walkers and in wheelchairs and how few youngsters there are, and you will see what's ailing our hobby. I believe that the future of the electronics industry in the United States lies in the health of Amateur Radio, and we have a very, very sick hobby."

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JUN 26 1985

FCC
Office of the Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 97 of	)	PR Docket No. 85-105
the Commission's Rules to	)	
Permit Automatic Control of	)	
Amateur Radio Stations	.)	

To: The Commission

COMMENTS OF
THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

The American Radio Relay League, Incorporated (the "League"), the national association of amateur radio operators licensed by the Commission, hereby respectfully submits its Comments[1/] in response to the Notice of Proposed Rule Making (the "Notice"), FCC 85-169, 50 Fed. Reg. 15196, released April 11, 1985. The Notice is based on the League's Petition (RM-4879), which requested amendment of the Amateur Radio Service Rules to permit automatic control of amateur digital communications above 30 MHz. In response to the proposal contained in the Notice, the League states as follows:

1/ These Comments are filed but one day late (albeit within the Reply Comment period). Good cause exists for this brief delay in submission of the same as explained in the Petition for Leave to Submit Late-Filed Comments filed contemporaneously herewith.

1. The League reaffirms its proposal that automatic control of digital communications be permitted on all amateur frequencies above 30 MHz as outlined in its Petition. In the Notice, the Commission has built upon the League's request, proposing that "any amateur station may be under automatic control, except where transmitting on frequencies below 29.5 MHz." In order to carry out its broader proposal, the Commission proposes to modify its Rules dealing with third-party traffic.

2. It is unfortunate that the Commission has introduced the issue of third-party traffic into this proceeding. It detracts from the primary purpose expressed in the Notice of keeping the amateur service abreast of technological developments such as computer-based message systems (CBMS) and other digital technologies. The proposed third-party Rules also impose unnecessary and onerous restrictions on the development and operation of digital communications networks. In fact, the proposal as presented in the Notice will not allow normal operation of CBMSs, which is contrary to one of the Commission's goals as stated in ¶3 of the Notice.[2/] What is supposedly allowed radio amateurs by permitting automatic control is at the same time

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2/ "Our goal is to keep the amateur service abreast of technological developments and to utilize new technology, such as CBMS, where appropriate. . . ." (Notice at ¶3.)

taken away by a proposed blanket prohibition from transmitting third-party traffic by automatically controlled stations[3/] as explained below.

3. The issue of third-party traffic on automatically controlled amateur stations first came to the fore in 1978. Amateur repeater stations were (and still are) permitted to be operated under automatic control.[4/] Many amateur operators at that time were just then discovering the value of interconnecting repeater stations with the public telephone system, particularly to allow user stations direct telephone access to emergency services such as fire and police departments. The device enabling this interconnection became known as an "autopatch," its name derived from the fact that it could, on demand, automatically "patch" a user station to the telephone system without the intervention of the repeater station operator. As more of these devices became operational, the casual use of autopatches increased. Their use

3/ Proposed §97.80(c) reads as follows:

> "(c) No amateur radio station may be operated under automatic control while transmitting third-party traffic."

Proposed §97.114 would amend that rule by the addition of a new paragraph (d) that would prohibit "(d) Third-party traffic from any amateur radio station under automatic control."

4/ According to §97.3(m) of the Rules, "Automatic control means the use of devices and procedures for control so that a control operator does not have to be present at the control point at all times."

became widespread in certain parts of the country, and the Commission, concerned with the potential abuse of amateur frequencies, reminded radio amateurs that unlicensed individuals must not be permitted unsupervised access to amateur frequencies or telephone interconnection authority would be eliminated in the Amateur Radio Service.

4. Specifically, on April 5, 1978, the Commission released a News Release which, in reference to autopatches, declared that "Section 97.79(d) states that 'the licensee of an Amateur station may permit any third party to participate in Amateur radio communication from his station, provided that a control operator is present and continuously monitors and supervises the radio communications to insure compliance with the Rules.'"[5/] The Commission in the same notice also stated that §97.79(d) clearly "prohibited autopatching and reverse autopatching through automatically controlled repeater stations and required a control operator to be on duty at all times during these operations."

5. What the Commission was seeking to guard against then was the origination and introduction of communications into the

---

5/ See News Release, Report No. 2028, Mimeo No. 8832, October 25, 1978.

amateur radio medium by unlicensed individuals. Autopatches, particularly reverse autopatch,[6/] create a situation fraught with the potential for abuse if left unsupervised by a control operator. Unlicensed individuals are not familiar with the restrictions against commercial use of amateur radio, nor with good amateur practices regularly employed by the licensed fraternity.[7/] The threat was a redefinition of the character of the Amateur Radio Service.

6. The Commission misapplies this point in the instant proposal, however, by seeking to prohibit "third party traffic from any amateur radio station under automatic control."[8/] A similar potential for abuse by unlicensed individuals in a digital amateur radio system exists only at the point where the third-party traffic is originated and introduced into the amateur radio medium. It is necessary to require a control operator at this stage only. This control operator will guard against the potential abuse of amateur frequencies in a digital system just

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6/ Reverse autopatches allow any individual who knows the correct phone number to initiate an amateur transmission on a repeater or other station.

7/ See, for example, "Phone Patch and Autopatch Guidelines" in The FCC Rule Book (published by the League) 3d ed., 1984, pp. 7-7 and 7-8.

8/ Proposed §97.114(d). Also see proposed §97.80(c).

as effectively as the control operator on duty at a voice repeater station when an autopatch is accessed. To impose the additional burden of a control operator at every point along the digital system, be it at a CBMS site or at every packet "digipeater" along the path to the message's destination is unnecessary. Such requirement, in fact, would severely curtail the use of the developing digital technologies because the burden on control operators would be nearly impossible to shoulder. For example, messages on a packet radio repeater are received at a rate of 1200 words per minute, and retransmitted immediately at that same rate. This would require a control operator to examine each packet at a rate of 600 words per minute to keep up with the throughput capability of such a repeater. Furthermore, speeds higher than 1200 words per minute are authorized, and technology is advancing toward higher and higher speeds.

7. The proposed blanket prohibition of third-party traffic on all automatically controlled stations would also have adverse effects that extend beyond the digital communications modes. It is common practice for radio amateurs to conduct nets for the purpose of exchanging and relaying third-party traffic. During a net, radio amateurs coordinate their communications on one or more frequencies at a pre-established time. On the very high frequencies, nets are commonly conducted through repeater stations, many of which are automatically controlled. The Rules already require two control operators, one each at the sending and receiving stations. Indeed, if the communications between

the stations exchanging third-party traffic were accomplished directly (i.e, without going through a repeater), there would be no further inquiry. However, the happenstance of the traffic being automatically relayed through a repeater would, according to the Commission's proposal, require yet a <u>third</u> control operator. The repeater station would not be able to operate under automatic control because "no amateur radio station may be operated under automatic control while transmitting third-party traffic."9/

8. We urge the Commission to modify its proposal so as not to impose a blanket prohibition of third-party traffic on stations operating under automatic control. We believe that the best way to achieve the goal of promoting the developing technologies in digital communications is to leave §97.79 intact with the possible exception of clarifying §97.79(d) to read as follows (proposed addition is underlined):

> (d) The licensee of an amateur radio station may permit any third party to participate in amateur radio communication from his station provided that a control operator is present and continuously monitors and supervises the radio communication to insure compliance with the rules. <u>Participation means the origination, introduction or reintroduction of a communication into the amateur radio medium by a third party.</u>

9/ Proposed §97.80(c).

The proposed addition of this language to §97.79(d) has the added benefit of clarifying that a control operator is required during operation of simplex autopatches.

9. It is further urged that proposed Rule §§97.80(c) and 97.114(d) not be adopted, and that the Commission instead adopt the wording of §97.80, as originally proposed by the League, as follows:

§96.80 Automatic Control of Digital Communications.

> Amateur Radio Stations may be operated under automatic control on frequencies above 30 MHz when utilizing digital communications pursuant to §97.69, provided that the control functions include (i) adequate provision for detection of transmitter malfunction and discontinuance of transmitter operation in the event such malfunction is detected; (ii) devices installed and procedures implemented to ensure compliance with the rules when a duty control operator is not present at a control point of the station. Upon notification by the Commission of improper operation of a station under automatic control, operation under automatic control shall be immediately discontinued until all deficiencies have been corrected.

THEREFORE, the foregoing considered, the League recommends that the Commission extend automatic control to amateur digital communications above 30 MHz. The League also requests that the proposed blanket prohibition of third-party traffic transmitted on automatically-controlled stations not be adopted, and it urges

that §97 be amended by the adoption of §97.80 as originally proposed by the League.

Respectfully submitted,

THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

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By: Christopher D. Imlay

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(202) 296-9100

June 26, 1985

June 18, 1985

To: ARRL Ad Hoc Committee on Amateur Radio Digital Communications

Subject: Interim Operating Authority on Mode L

Enclosed is a facsimile of an FCC Order released on June 18, 1985.

Note that it grants this authority to Amateur Extra class licensees only. We and AMSAT have heard from Ray Kowalski at the FCC that this restriction was in error. Also, we have pointed out to him that "Amateur Radio Service" at the end of paragraph 4 should read "Amateur Satellite Service".

We understand that the FCC will issue errata but have not seen the specific language or know when it will be issued as all this occured telephonically today.

73,

Paul L. Rinaldo, W4RI
Chairman

Enclosure

Before the
Federal Communications Commission
Washington, D.C. 20554

PR
FCC 85-314
35905

In the Matter of	)	
	)	
Amendment of Part 97 of the Commission's Rules to Implement the Final Acts of the World Administrative Radio Conference, Geneva, 1979.	))))	PR Docket No. 85-23

<u>Order</u>

Adopted: June 12, 1985 ; Released: June 18, 1985

By the Commission:

1. In the <u>Notice of Proposed Rule Making</u> in this proceeding, 50 FR 5797, February 12, 1985, we proposed to amend the rules in the Amateur Radio Service (47 C.F.R. Part 97) to implement many of the decisions we made in the <u>Second Report and Order</u> in General Docket No. 80-739, 49 FR 2357, January 19, 1984, pursuant to the Final Acts of the 1979 World Administrative Radio Conference. The actions we proposed to take included addition of the 1260-1270 MHz frequency band to the Amateur Satellite Service pursuant to footnote 664 to the Table of Allocations in 47 C.F.R. §2.106.

2. The American Radio Relay League, Inc., (ARRL) has filed a Motion for Interim Operating Authority to permit amateur satellite operation on the 1269.05-1269.85 MHz band segment on a non-interference basis during the pendency of this proceeding. The ARRL stated that FCC-licensed amateurs are currently at a disadvantage internationally because without access to this spectrum they cannot use Mode "L" operation (a 1269.05-1269.85 MHz uplink and a 436.95-436.15 MHz downlink passband) on the Oscar 10 amateur satellite. Mode L is activated on certain days of the week by the AMSAT-DL operator in the Federal Republic of Germany. At those times, FCC-licensed amateur operators are currently denied the use of Oscar 10. See Comments of the ARRL at 7.

3. For the reasons stated above we conclude that it is in the public interest to permit interim use of Mode "L" operation by FCC-licensed amateur operators. We have coordinated this matter with the Interdepartmental Radio Advisory Committee (IRAC). We have been informed that members of IRAC have no objection to such interim operation.

4. Accordingly, IT IS ORDERED , pursuant to Sections 4(i) and 303(r) of the Communications Act, as amended (47 U.S.C. §§154(i) and 303(r)) that during the pendency of this proceeding Amateur Extra operators may use the frequency band 1269.05-1269.85 MHz in the Amateur Satellite Service on a secondary non-interference basis. This interim authority shall remain in effect until final action is taken in this proceeding on the proposal to implement allocation of the 1260-1270 MHz frequency band to the Amateur Radio Service.

5. IT IS FURTHER ORDERED, That the Motion for Interim Operating Authority filed by the American Radio Relay League, Incorporated, in this proceeding on February 6, 1985, IS GRANTED.

6. IT IS FURTHER ORDERED, That this interim operating authority is effective on the date of release of this Order.

7. For further information about this proceeding contact John J. Borkowski, Private Radio Bureau, Washington, D.C. 20554 (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

ICOM INCORPORATED

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Mr. Paul L. Rinaldo
Manager, Technical Department
The American Radio Relay League, Inc.
Newington, Connecticut, U.S.A. 06111

June 14, 1985

Dear Mr. Rinaldo,

With regards to your letter dated September 20, 1984, concerning a digital coded squelch signalling system, I would like to report the results of the standardization work done by the JAIA.

From last October, 1984, we have held specialized meetings which were called "DWG" (Digital Working Group), to conduct the official work of the JAIA, so that we might develop and produce a worldwide standardized system of Amateur radio digital signalling.

The result of the meeting was that we could not reach a mutual consent among maunfacturers, since one of the manufacturers refused to change to a system recommended by the majority of the group and elected to keep his own system.

Thus, the rest of major manufacturers, YAESU, STANDARD, and ICOM have decided to develop a standard protocol together, called "AQS" (Amateur Quinmatic System; Quinmatic = Quint + Automatic)

Although we are not in a position of fixing availability of the AQS system in the marketplace at this stage, we will keep you informed on a timely base of its development.

This system is not to be considered as a digital communication, like a packet radio, but is being developed to be utilized as a supporting system for voice communication. Therefore, this AQS system will have functions, such as a callsign squelch, digital code squelch, automatic traffic linking (like Japanese personal radio), and short comment communication (operator's name, address, etc.)

For your information, we are considering adopting the AX25 protocol, which your committee has developed, when we enter a market for a true digital communication system in the future.

Should you have any further questions on this matter, please feel free to ask us at any time.

Sincerely,

ICOM INCORPORATED

T. Inoue

Tokuzo Inoue
President

Before the
Federal Communications Commission
Washington, DC 20554

In the matter of	)	
	)	PR Docket No. 85-105
Amendment of Part 97 of the	)	RM-4879
Commission's Rules to permit	)	
automatic control of	)	
Amateur Radio stations	)	

Comments filed in RM-4879 on 21 June 1985 by

Robert C. Clements
Four Paul Revere Road
Lexington, MA 02173

1. I concur with the intent of this Notice of Proposed NPRM. I wish to suggest some clarifications to the specific rules changes as proposed in the Appendix to the NPRM. I also wish to suggest an extension to the intent of the NPRM, which I believe is in the public interest.

2. Clarifications

2a. A minor grammatical point: The proposed and rewritten paragraph 97.79(b) uses the verb "must" rather than "shall". Since the entire part 97 uses "shall", there seems to be no particular reason for this change.

2b. The commission's comments do not mention the clarifying change included as the last sentence of this paragraph, regarding the presumption that the licensee is the control operator unless documentation exists to the contrary. While I agree entirely with this change, I wonder whether it is valid considering that it was not a part of the original petition. Perhaps the commission's comments in the final report and order could address this point.

2c. The proposed section 97.80(a) is unnecessarily complicated and confusing. The intent is to say that automatic beacon operation is only allowed on the frequencies listed in paragraph 97.61(e). The proposed wording, by listing all the other pieces of the VHF and UHF bands, is cluttered and unclear. In the commission's introduction to this NPRM, the commission states, in part, "... to expand automatic control, ... prohibiting its use only in those situations where ... automatic control should not be allowed." The structure and wording of the new rule should follow this intent. I suggest the following simpler wording:

97.80 Operation under automatic control.

(a) An Amateur Radio station may be operated under automatic control except in the following circumstances:

(1) An Amateur Radio station may not be operated under automatic control while transmitting on frequencies below 29.5 MHz.

(2) An Amateur Radio station in beacon operation may not be operated under automatic control except on the frequencies listed in section 97.61(e).

(3) An Amateur Radio station may not be operated under automatic control while a third party is participating in the operation as described in section 97.79(d).

2d. Clarification on third party TRAFFIC vs third party PARTICIPATION.

I am sure that the commission will be hearing from other commentors regarding the confusion between "third party traffic" and "third party participation" that appears in the proposed new section 97.80(c). I hope and assume that the intent of the commission was not to disallow the automatic forwarding by Amateur Radio stations of radiograms originated by, or addressed to, third parties. If so, I strongly oppose such a restriction. Such an action would essentially nullify the benefits of the entire rulemaking as it affects message forwarding operations.

Assuming that third party PARTICIPATION is what the rule is intended to prohibit, I suggest the rewording presented above (my proposed 97.80(a)(3)) in place of the commission's proposed 97.80(c).

The present definition of third party traffic, in section 97.3(v) mentions the supervision of a control operator. I believe it is appropriate to delete that reference and to add a new definition of third party participation. The requirement for a control operator would be added to the "participation" definition. The reference to "participation" would then be appropriate for the automatic operation restriction above. My suggested wording:

97.3(v) Third party traffic. Amateur Radio communication on behalf of anyone other than the control operator.

97.3(aa) Third party participation. Amateur Radio communication by or under the supervision of the control operator of an Amateur Radio station wherein a person other than the control operator participates in the radio transmission. Such participation includes modulating the transmitter by speech or telegraphy or any other means, whether at the control point or by connected communication facilities.

The proposed new section 97.114(d) would not be added, as it really should apply to third party PARTICIPATION, and would be covered as described above.

3. Suggested extension

The commission proposes to continue to prohibit automatic operation of an Amateur Radio station on frequencies below 29.5 MHz. I respect the feeling that unrestricted automatic operation on such frequencies, with their international character and their high crowding, is inappropriate.

However, it is also true that there are specific situations where a disciplined and restricted use of automatic operation on the HF frequencies could be of great importance to the development of automated message handling in the public interest by the Amateur Radio service.

At the present time, there does not exist any reliable cross-country channel for the forwarding of messages by the use of VHF/UHF frequencies. There is not yet a geosynchronous satellite usable by the Amateur service. The use of the low-orbit OSCAR satellites is not yet adequate to this task, either, as shown by the rather disappointing results of the well-intentioned "Teleport" STA of a year ago.

Until the satellite situation improves, therefore, there is at least a temporary need for digital message forwarding on HF frequencies. This operation normally occurs on specific frequencies, widely agreed to by "gentlemen's agreement", and under well controlled conditions entirely appropriate for automatic operation. Due to the time-of-day requirements of the characteristics of the HF bands, it is difficult to guarantee operator coverage for a widespread message forwarding network at times when the HF bands are open for communication. The consequent lack of such a network is a hindrance to the development of modern traffic handling technology in the Amateur service.

I therefore respectfully suggest that the Commission consider permitting automatic operation of Amateur stations using A1. A2, F1 and F2 emissions on those portions of the 1.8 to 29.7 MHz spectrum where those modes of operation are permitted. Such operation would be under the same restrictions as automatic operation above 30 MHz.

If this viewpoint is accepted by the Commission, my proposed wording of 97.80(a)(1) would then become:

> (1) An Amateur Radio station may not be operated under automatic control while transmitting on frequencies below 29.5 MHz, except while using A1, A2, F1 and F2 emissions.

This could be restricted further by additional qualifications regarding radiogram traffic or the like, which would require the addition of further definitions to section 97.3. I believe that such restriction should not be applied at this time, but only be added if a need becomes clear in the future.

If the commission chooses not to permit such operation as a general practice, I request that it address this issue in its comments, and consider the issuance of STAs for this operation by those wishing to establish such a network. I believe the suggested rule change would be appropriate, however, and would certainly require less manpower on the part of both the Commission and the Amateur community than the STA method.

Respectfully submitted to the Federal Communications Commission,

Robert C. Clements

EAST-MAP.Ø15
July 3Ø, 1985
by K1HTV

The following is a graphic representation of Packet Radio links which are believed to exist on 145.Ø1Ø MHz on the East coast of North America.

```
                   VE3???      <---- Toronto,Ont)
                        *
                          *
(pbbs-no mail    VE3HWW - - VE3LSR      <----- Barrie,Ont)
 forwarding yet)              *
                                *
                             VE3PBA       <----- Bancroft,Ont)
                                  *
                                    *
                                     VE3DVQ    <----- Lavant,Ont)
                                    /   *
                                VE3???   *    <----- Kingston,Ont)
                                           *
 (Ottawa,Ontario---> (pbbs)  VE3FXI - - - VE3PAK
                                              *               VE2???  <-- Que.)
                                               *                 |
                 (Lyon Mtn- Plattsburg,NY ----->  W2UXC-1        |
                                                    *            |   to Maine
                      (s. Plattsburg,NY ----->        KD2AJ      |     /
                                                        *        |    /
                      (Mt.Washington,NH----->              *     W1HJF-1
                                                             *    /\ \
                               (Mt Ascutney,VT -----> WA1TLN-1 /   \ \
                                                       * | \  \/     \ \
                                                       * |   \/\      \  \  pbbs
                        (East Kingston,NH ------>      * |  / \  \     \  WB1DSW
                                                       * |/   |   \     \   |
                         (Goffstown,NH pbbs ----->     */|    |    \   KE1G-1
                      (Peru,MA ------>               KY1H |    |     \  |  \
                                                     / **\|    |      \ |    \
HF links from         (Haverhill,MA ----->          / * * \    |      K1KKM    |
WØRLI include:                                     / *  * |\   |       /   \   |
-------------         (Lowell,MA ----->           /  *  * | \  |     KD2S-1   | |
GA  N4CI                                         /   *  * |  | |    /  | \\\ | |
GA  KI4XO             (Westford,MA-pbbs->        |   *  * |  | | / WØRLI |\\| |
GA  KF4JF                                        |   *  * |  | |/ /      | ||\|
CA  KD6SQ             (Princeton,MA ----->       |   *  * | K1LLR-1      | || \
OH  KA1PN-1                                      |   *  * |     \      /  || | \
IA  KIØQ              (Billerica,MA ---->        ?   *  * |      \ W1DC   || | |
AZ  K7PYK                                        |   *  *  \      \/ |\   || | |
SC  WA4SZK            (Harvard,MA - pbbs ---->   |   *  *   \    KA1T \| \ || / |
                                                 ?   *  *    \   pbbs  |\ \||/  /
                      (Wakefield,MA --->         |   *  *     \        | K1UGM /
                                                 |   *  *      \   pbbs|  /   /
                      (Lexington,MA ----->       ?   *   *      \    K1BC   /
                                                 |   *   *       \     |  /
                      (Foxboro,MA ----->         |   *   *      WB1EMT-1
                      (Newington,CT---->         |   *   *           |\  \
                                                 ?   *   *           | |  |
                      (Coventry,CT-->            |   *   *   K1JCL-1 | |  |
                      (Falmouth,MA ---->         |   *   *   /   \   | |WA1GPO-1
                (Cranston,RI pbbs  ---->         |   *   *  /   N1DKF |  |
                      (Newington,CT---->         |   * W1AW-5        \ |  |
                                                 ?   *   * \          \|  ?
                      (Newington,CT ----->      /     *   * W1AW-4(pbbs)\|  |
```

```
                     (Mattapoisett,MA ---->   /                          W1ZHC
                      (Wolcott,CT--->        /        WA1IXU
   to Rochester              (pbbs)      ?               *
            \              WA2RKN-2     /                *   <--- Hyde Park,NY)
(Binghamton,NY ---> \      W2OW    *   /                *
(Mt.Beacon,NY --->   \      |      WB2KMY-1 * * * * KG1O-9 <-- Mt.Ninham,NY)
   (Ithica,NY ----> K2VD    |      / /\*  |......../ *|   \
                      \     |    /  /  \*         / |* |   \
                       \    |   / /     |*  WA2VKH  *\ |    \<-Carlstadt,NJ)
   (Greenstown,PA ---->  \  | |  WB3EIJ | *   |    * WB2VKN-1 \  <----NYC)
   (Wysox,PA ----->   K3HSK | | /       |   *  |  *   /   |    \  \
   (Freeport,NY --->      \ | |/         \   * | *   /    |     AI2Q
   (Honesdale,PA ----->    \ KB3ZW        \   *|*   /     |      |
    (Oakland,NJ ----->      \  |           \ WA2SNA-2 **|*****|* WA2SNA-1
                             \ |            \   * /  |        |     |  (pbbs)
                              \|             \* /    |        |     |
    (Little Falls,NY ----->    \|             *\/    |  N2DSY-2 |
    (Wilkes Barre,PA ----->   K3RLI-1         * /\   |    |    /
                              /  |            */  \  |    |   /
    (Berwick,PA--->WA3DQI - KA3DWA  |         *|   \ |    |  /
    (Wilkes Barre,PA-pbbs --> ?   K3RLI(pbbs) *|    \|    | /
    (               ,NJ ----->   |            *|   WB3FSR-1
                                 ?            *|    /
       (Reading,PA ----->  WB3FYL             *|   /
                            /  \              *|  |
  (Harrisburg,PA     AK3P-5 ***\*AK3P(pbbs)   *|  |    <----Hummelstown,PA)
                        *       \/ (.01&.05)  *|  |
                        *       /\   input    *|  |
(York,PA ----->         *  W3HZU-8 \          *|  |
                        *  (.050)   \         *|  |
                        *          K3DSM-5    *|  |    <----- Malvern,PA)
                         *          / \       *|  |
                          *        /   \ WB2MNF *|  |   <---pbbs Medford,NJ)
                           *      /    /\   *  *|  |
                            *   | KC2TN  \   *  *|  |   <--pbbs&HF gateway Atco,NJ)
(Crowfoot,NJ --->             * | /        \ * *|  | K3GYS (pbbs & 220 gateway)
(future NW MD--> WB4APR-7      * |/          \ **|  |/
    (Elk Neck,MD ----->    WB4APR-6 * * * * WB2RVX   <--- Voorhees,NJ & pbbs)
                               *
                              *
N8FJB --050--- W3TMZ         *         <---- Mt Airy,MD 145.050)
(Harpers Ferry)  \          *
 WV pbbs         050       *
                   \     *
                    \*
 Clarksville,----> W3IWI--050-- W3GXT-5  <---Baltimore,MD on 145.050)
MD[pbbs,.01 & .05]  * | \           |
                   *  |  \          |
                  *   | W3VD-5      |    <--- Columbia,MD  on 145.050)
                  *   |    \        |
                  *  KS3Q   \      050      <----pbbs Burtonsville,MD)
                  *  050     050    |            scans 145.01,05 & 09
                  * /          \    |
                  */            \   |          (145.050 pbbs & 30M Gateway)
(Wash.DC-->WB4JFI-5           WB4APR-5       <-------- Annapolis,MD)
           /     |
     WB4FQR-4    |  <----- Woodbridge,VA)
                 |                        K3TKJ-1 <----- Salisbury,MD)
                 ?                        /  |  \
                 |                K3JYD-5    |   |       [soon] <-- Southern MD)
                 |                   ?       |   |
               WG4T                  |       |   |      <---- Charlottesville,VA)
Poor Mtn SW      |                   |    WA4TVS |      [soon] <---- Parksley,VA)
of Roanoke,VA    |                   |     /  |  ?
N4FHL-1 * * * *  |                   |    /   |  |
              K4LKQ-1                ?   /    |  |  <--Tobacco Rd Mtn-Lynchburg)
                \                    |  /     |  |
                 \                   | /      ?  |
                  \               K4UMI-5     |  ?      <-----------Norfolk,VA)
future Sauertaun Mtn ?               \    | /
site Winston-Salem,NC \            WA4KVX-1    <-----VA Beach,VA)
                       \
                      AA4L                  <----- Raleigh-Durham,NC)
```

A graphic map of Packet Radio links south from Virginia south to Florida can be found under the file name of SOUTHMAP.### , available on many of the same PBBSs carrying this EAST-MAP.### file.

Please send any corrections or additions to the above linking map to me, K1HTV @ W3IWI via one of the EASTNET Packet Radio Bulletin Board systems, the U.S. mail, or give me a phone call. Thanks.

73,

Rich Zwirko - K1HTV
12509 Ransom Drive
Glenn Dale, MD 20769
phone (301)464-2133 (5:00-10:00 PM)

C2976 CC14 Tom Clark (W3IWI,2976)   8/ 5/85 12:07 AM L:86
KEYS:/SOUTHMAP.015/DE K1HTV/LINKS FROM N.C. SOUTH TO FLA/
A: 12

SOUTHMAP.015
Revised July 30, 1985
by K1HTV

This file is a graphic map showing Packet Radio links covering the area from North Carolina south to southern Florida. You can see links the from North Carolina northward to the Canadian border under a file named EAST-MAP.### , available on many PBBSs carrying this SOUTHMAP.### file.

```
--------------------------------------------------------------------------------
               WG4T     <------ Charlottesville,VA)
Poor Mtn SW      |
of Roanoke,VA    |
N4FHL-1 * * * * K4LKQ-1   <---- Tobacco Row Mtn - Lynchburg,VA)
                  \
                 W4???   <--- future Winston-Salem,NC site)
                   \
                   AA4L              <----- Raleigh-Durham,NC)
                    | \
                    |  WA5SZL pbbs      <----- Raleigh,NC)
                    |       \
                    |        ?
                    |         \
                    |        K4CYP     <----- Goldsboro,NC)
           to      W4???               <----- Charlotte,NC)
          W.NC       \
  AA4EO-2   |         \          <----- Lookout Mtn, TN)
       \    |          ?
       AA4EO-1          \        <------ Rocky Face,GA)
           |             \
           |           WA4SZK(pbbs) *  W4ULH-1     <------ Florence,SC)
           |
       WB4GQX-1                 <----- Cumming,GA)
        /  \   \
   KI4XO    \    \              <----- Marietta,GA pbbs & HF gateway)
             \   N4CI           <----- Conyers,GA pbbs & HF gateway)
        W4EAW-1                 <----- Bussee Mtn,GA)
           |
        WA4TXT-1                <----- Hampton,GA)
            \
         WB4GQX-2               <----- Forsyth,GA)
          /   |
        ?     |
       /      |
  K4ABT-1     |                 <------ Phenix City,GA)
       \      |
        ?     |
         \    |
       WD4LYV-1                <----- Sycamore,GA)
            \      KF4JF-0     <----- pbbs & HF gateway)
             \    /
          KF4JF-1              <----- Tifton,GA )
          /    \
     WB4ZNW     \              <----- Moultrie,GA 146.13/73 gateway)
              WB4RCY-1         <----- Jacksonville,FL)
               *   \
              *     \
          KF4TT-6     \        <----- Gainsville,FL PBBS & HF gateway)
               *      ?
             K4OZS   \         <----- Ocala,FL)
              /    *  \
            /        * \
   near future(?)       N4JWX         <----- Orlandao,FL)
          /               *
        /     (Tampa)     *
  KC2FF-7 * *  W1BEL     N2WX-7       <----- Melbourne,FL)
(Clearwater)        *   *  *
               KE4PM-1  *             <----- Lake Wales,FL)
                    \   *
                     \  *
                   K4NTA-1            <----- Stuart,FL)
                       *
                  WA4ARE-1            <----- W.Palm Beach,FL)
                       *
                  WB4QNX-1            <----- Boca Raton,FL)
                       *
                  WA4WHD-1            <----- Hollywood,,FL)



                       *
                    W4NVU             <----- Miami,FL)
```

Please send any corrections or additions to the above linking map to K1HTV @ W3IWI via one of the Packet Radio Bulletin Board systems, the U.S. mail, or a phone call. Thanks.

73, Rich Zwirko - K1HTV
12509 Ransom Drive
Glenn Dale, MD 20769
phone (301)464-2133 (5:00-10:00 PM)

BRITISH AMATEUR RADIO TELEPRINTER GROUP

Tel: (24-hour radio pager service)
01-388 6151 pager no 0228034

Ian Wade, G3NRW
7 Daubeney Close
Harlington
DUNSTABLE
Bedfordshire
LU5 6NF
England

JULY 1985

BARTG PRESS RELEASE - FOR IMMEDIATE RELEASE

==
BARTG PUBLISHES THE SUMMER 1985 ISSUE OF DATACOM
==

The British Amateur Radio Teleprinter Group has published the summer 1985 issue of its magazine DATACOM. It is another large edition, with 120 pages of news, views and technical articles on all aspects of RTTY, AMTOR, Packet Radio and FAX. Special features include:

- Full technical and constructional details of the ST5C Terminal Unit. The ST5C connects between a transceiver and a home computer, and converts received RTTY or AMTOR tones to TTL levels suitable for input to the computer. In the reverse direction, the ST5C provides a tone generator which accepts TTL input levels from the computer and converts them to audio tones for input to the transmitter. Many of these ST5C units are now in regular use, and they are particularly suited to handling weak, noisy signals under heavy interference. BARTG supplies printed circuit boards and kits for the ST5C, together with complete ready-to-go units which are fully built and aligned for immediate use.

- Full details of a unit to convert from a parallel Centronics interface to serial RS232.

- Suggested circuits and ideas for audio notch filters, sidetone monitoring of RTTY transmissions, driving teleprinters on low voltage, improving efficiency in RTTY transmitters, and many more. .../

BARTG PUBLISHES SUMMER 1985 DATACOM - Page 2 of 2

- Results of a survey showing the use of RTTY on 45.45 and 50 bauds throughout the UK. This is the first survey of its kind published by BARTG, showing in detail which parts of the country use these two speeds, and will be of particular interest to RTTY repeater builders, emergency network planners and DX operators.

- Full details of how AMTOR can be used through the Oscar 10 satellite.

- Packet Radio news, including information on where to find out about packet, and details of the new TNC2 Terminal Node Controller (TNC) which lets a simple home computer run packet to the full internationally approved AX.25 Packet Radio specification.

DATACOM is published quarterly by BARTG, and is supplied free of charge to members. Full membership details, including free copies of the leaflets "BARTG in the Eighties" and "BARTG and Data Communication" are obtainable on receipt of an SAE from:

Mrs Pat Beedie, GW6MOJ
BARTG Membership Secretary
"Ffynnonlas"
Salem
Llandeilo
Dyfed, Wales
SA19 6EW

Tel: 0558 822286

ENDS

Before the
Federal Communications Commission
Washington, D.C. 20554

PR
FCC 85-341
35938

In the Matter of	)	
	)	
Amendment of the Amateur Radio	)	PR Docket No. 85-215
Service Rules to allow auxiliary	)	RM-4885
operation on all amateur	)	
frequencies, except 431-433 MHz	)	
and 435-438 MHz.	)	

NOTICE OF PROPOSED RULE MAKING

Adopted: July 5, 1985 ; Released: July 10, 1985

By the Commission:

1. Notice of Proposed Rule Making in the above-captioned matter is hereby given.

2. On December 28, 1984, the Quarter Century Wireless Association (QCWA) filed a petition (RM-4885) requesting that the Amateur Rules be amended to permit auxiliary links to be used by amateur operators on all amateur frequencies. The present rules permit amateur operators to engage in auxiliary operation only on frequencies above 220.5 MHz (except 431-433 MHz and 435-438 MHz). Auxiliary operation is defined in Section 97.3(l) of the Amateur Rules as radio communication for remotely controlling other amateur radio stations, for automatically relaying the radio signals of other amateur radio stations in a system of stations, or for intercommunicating with other amateur radio stations in a system of amateur radio stations. No comments concerning the petition were filed.

3. In support of its petition, the QCWA states that the technological state of the art has made restrictions on auxiliary operation unecessary. According to petitioner, allowing auxiliary links to be used on all amateur frequencies would provide the Amateur Radio Service with a variety of options such as in-band control including the use of tertiary offsets; cross polarization

of antennas; new cross-band modes of operation; and independent sideband for simultaneous control and repeater operation (referenced to the same suppressed carrier frequency). Petitioner believes that the general use of auxiliary links would provide more flexibility for amateurs operating remotely-controlled stations and greatly simplify the operation of repeaters and remotely-controlled stations.

4. The rationale for expanding the use of auxiliary links in the Amateur Radio Service is consistent with our proposal in PR Docket 85-105 to broaden the uses of automatic control. In that proceeding[1] we said:

> ". . . we believe that now may be the appropriate time to expand automatic control to all amateur operations, prohibiting its use only in those situations where there is a justifiable reason why automatic control should not be allowed."

It appears that this approach is as valid for "auxiliary links" as it is for "automatic control". For these reasons, we propose to permit auxiliary links on all amateur frequencies, except on frequencies between 431-433 MHz and 435-438 MHz where we would continue to protect such activities as weak-signal communications, moonbounce experimentation and satellite transmissions. As in Docket 85-105, we invite amateur radio operators in general, and amateurs experienced in auxiliary operation in particular, to submit comments calling to our attention any problems that may arise by expanding the use of auxiliary links.

5. For purpose of this non-restricted notice and comment rule making proceeding, members of the public are advised that *ex parte* contacts are permitted from the time the Commission adopts a Notice of Proposed Rule Making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting. In general, an *ex parte* presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a

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1 See Notice of Proposed Rule Making in PR Docket No. 85-105, adopted April 5, 1985; FCC 85-169; 50 FR 15196, April 17, 1985.

member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written *ex parte* presentation must serve a copy of that presentation on the Commission's Secretary for inclusion in the public file. Any person who makes an oral *ex parte* presentation, addressing matters not fully covered in any previously-filed comments in the proceeding, must prepare a written summary of that presentation; on the day of the oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each *ex parte* presentation must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's Rules, 47 CFR 1.1231. A summary of the Commission's procedures governing *ex parte* contacts in informal rule makings is available from the Commission's Consumer Assistance Office, FCC, Washington, D.C. 20554, (202) 632-7000.

6. Authority for issuance of this Notice is contained in Sections 4(i) and 303(g) and (r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and 303(g) and (r). Pursuant to applicable procedures set forth in Section 1.415, 47 CFR 1.415, of the Commission's Rules, interested persons may file comments on or before September 24, 1985, and reply comments on or before October 25, 1985. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information is placed in the public file, and provided further that the fact of the Commission's reliance on such information is noted in the Report and Order.

7. In accordance with Section 1.419 of the Commission's Rules, 47 CFR 1.419, formal participants must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All

comments are given the same consideration, regardless of the number of copies submitted. Each set of comments must state on its face the proceeding to which it relates (PR Docket Number) and should be submitted to: The Secretary, Federal Communications Commission, Washington, D. C. 20554. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D. C.

8. In accordance with Section 605 of the Regulatory Flexibility Act of 1980 (5 U.S.C. 605), the Commission certifies that these rules would not, if promulgated, have a significant economic impact on a substantial number of small entities because these entities may not use the Amateur Radio Service for commercial radiocommunication (see 47 CFR 97.3(b)). In addition, the proposed rules allowing auxiliary operation on additional amateur frequencies would not significantly impact manufacturers of amateur radio equipment since auxiliary operation on the additional frequencies proposed herein would be optional rather than mandatory.

9. In view of the foregoing, rule making petition RM-4885 filed by the QCWA IS GRANTED insofar as we propose to allow auxiliary operation on additional amateur frequencies and IS DENIED insofar as the restrictions prohibiting auxiliary operation on frequencies between 431-433 MHz and 435-438 MHz are retained.

10. IT IS ORDERED, That the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and the Secretary shall also cause a copy of this Notice to be published in the Federal Register.

11. For information concerning this proceeding, contact Maurice J. DePont, Federal Communications Commission, Private Radio Bureau, Washington, D. C. 20554, (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachment: Appendix

APPENDIX

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations would be amended, as follows:

1. The authority citation for Part 97 would continue to read as follows:

   Authority citation: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303.

2. Section 97.86 (d) would be amended to read:

   §97.86 Auxiliary operation.

* * * * *

   (d) All amateur frequency bands, except 431-433 MHz and 435-438 MHz, are available for auxiliary operation.

July 11, 1985

MEMORANDUM FOR: Amateur Radio Manufacturers

SUBJECT : What Manufacturers Can Do to Speed the Growth of Amateur Packet Radio

1. Executive Overview: Packet radio is now out of its infancy. Many users are impressed with its present capabilities. More-advanced experimenters understand that packet radio holds much greater promise as the network develops and new services are evolved. What has been achieved in amateur packet-radio protocol standardization, hardware and software is substantial. Nevertheless, there are some problems that need to be solved in the short term to permit progression from 1200- to 9600-baud operation. There is even greater work to be done in the longer term to develop a network with intercity trunks operating at 56 kilobauds or perhaps as high as 1.544 megabauds. Much of the development, thus far, has been pioneered by amateur groups with industry entering the picture only recently. It appears that this is the time for industry to become serious about giving packet radio a boost and helping it to proliferate worldwide. We have already seen commercial and military spin-offs of amateur packet-radio systems. This paper outlines the status of packet-radio development, provides some information on guiding principles and lists ideas on what industry can do to help develop packet radio worldwide.

2. <u>Status of Packet-Radio Development</u>: What started with a few amateur experimenters in Canada and the United States has grown to about 4000 amateur packet-radio stations throughout the world as of late April 1985. By April 1986 estimates place the number at 10,000 or more packet stations.

a. Most of the activity (perhaps 90%) is on 2 meters at 1200 bauds using Bell 202 modems, a variety of terminal-node controllers (TNCs), and almost any available radio.

b. HF activity (perhaps 10%), most of it is on 20 meters (around 14100 kHz) and 30 meters (around 10147 kHz). The current mode is 300 bauds using Bell 103 modems, a variety of TNCs, and any HF radio. The main problems with HF packet radio are (1) correct tuning of the SSB radio to center the tones in the modem filter passbands, and (2) interference (QRM, ISI, etc.) introduced by the HF medium. Nevertheless, operators generally are pleasantly surprised how well packet radio works via HF once the radio is perfectly tuned.

c. In several areas of the United States, principally on the East and West Coasts, a single 1200-baud packet-radio channel (such as 145.01 MHz) is becoming congested during evening hours. This is the result of the combination of: (a) individual QSOs through 1 to 8 digipeaters as permitted in AX.25 level 2, (b) people accessing computer-based message systems (CBMSs)(also known as bulletin boards and mailboxes), and (c) automatic message forwarding between CBMSs using the software written by WØRLI. This congestion has caused people to seek and obtain coordination on additional channels, particularly 145.03, 145.05, 145.07 and 145.09 MHz, all of which are compatible with the ARRL 2-meter band plan.

d. There is also strong interest in using the 220-MHz band for 9600-baud packet radio, particularly for intercity links. The reason for choosing 9600 rather than a higher speed is that nearly all of the TNCs can operate at this speed, the exceptions being those that implement the packet assembly/ disassembly in software rather than hardware. The desire to operate at 9600 Bd on 220 MHz is frustrated by the lack of modems and radio equipment.

(1) A new modem is needed for 9600-baud operation.

(a) The leading contender is one designed by Steve Goode, K9NG, and was described in the proceedings of the Fourth ARRL Amateur Radio Computer Networking Conference. The Tucson Amateur Packet Radio Corporation (TAPR) is now in the process of producing a printed-circuit board to make this modem generally available by fall of 1985. On the transmitting side, the K9NG unit is a scrambler that produces shaped ± 5-V which keys a variable-capacitance diode that frequency-shift keys a transmitter oscillator. On the receiving side, it takes digital-

baseband output of the receiver's discriminator and descrambles it. We have not yet advised the Federal Communications Commission of the scrambling feature of the K9NG modem but intend to do that soon. We need to ascertain whether the FCC considers this acceptable under FCC rules section 97.117, which prohibits codes and ciphers. K9NG recommends a frequency shift of 3 kHz.

(b) The other contender, which does not seem to be as close to production, is a design by Gary Field, WA1GRC. It is a complete RF modem that operates at a center frequency of 21.4 MHz with a frequency shift of 9.6 kHz.

(2) Radios for 220 MHz, 9600-baud operation are not easy to obtain. Current efforts are on modifying Hamtronics modules to work with the K9NG modem.

e. Packet-radio operation via OSCAR 10 has been a disappointment to many who have tried it. Here are the problems: (1) the tuning difficulty mentioned above with HF, (2) poor signal-to-noise ratio of the satellite (around 19 dB at best), (3) unavailability of the satellite when you want to use it (because of its highly elliptical orbit), (4) unfavorable orientation of the satellite at certain times when it is available, and (5) spin modulation resulting from antennas damaged during separation. To date, Bell 202 modems have been used. There is a general belief that a more-robust modem would improve things.

f. There have been some successful 1200-Bd contacts via meteor scatter (MS). However, the speed is too slow to take advantage of some of the shorter meteor bursts. Commercial MS systems operate at 4800 Bd and have a throughput (averaged over a 24-hour day) of around 100 WPM. Commercial MS stations are restricted by FCC rules to 4800 Bd because of bandwidth limitations. Amateur rules permit up to "19,600" bauds if packet is interpreted as ASCII or a maximum of 20 kHz if it is interpreted as "any digital code." It is expected that 9600-Bd packet radio should work well via MS and that we can keep the bandwidth within 20 kHz. Except for having a 9600-Bd modem, the ARRL Headquarters station, W1AW, is set up to conduct MS tests with other stations up to 2000 km away.

g. There is a long-range desire to operate packet radio at higher speeds, particularly for intercity network trunks. The speeds most talked about are 56 kilobauds and 1.544 megabauds. Above 220.5 MHz, the maxima are a speed of 56 kBd or a bandwidth of 100 kHz. In the 220-MHz band, we are looking at the frequency range of 220.5 to 221 MHz for 9.6- and 56-kBd packet radio operation. Above 1215 MHz, there is no bandwidth limitation except to stay within the Amateur Radio bands. Subbands permitting packet-radio operation at speeds on the order of 1.544 MBd have been made in the ARRL band plan for 23 cm and the interim band plan for 33 cm. The 56-kBd speed is based on North American telephone practice. If there is a reason to raise this speed to (say) 64 kBd to conform to CCITT Integrated

Services Digital Network (ISDN) recommendations, the FCC could be petitioned to permit that speed. The 1.544-MBd rate is one used in the North American T1 system. At the present time, this is only to indicate an order of magnitude for the highest speed for certain trunks in a fully developed network.

h. Here is the status of amateur packet-radio protocol development:

(1) Physical Layer: A rough draft of a protocol has been circulated among members of the ARRL Ad Hoc Committee on Amateur Radio Digital Communications (Digital Committee) some time ago. Several months' work is needed to finish it, however it has not been considered to be high priority. Also, we expect to see some more experimentation with connectors, higher data rates and modems.

(2) Link Layer: The AX.25 link-layer protocol, approved by the ARRL Board of Directors in October, 1984, has gained acceptance worldwide. No one has reported any bugs that necessitate any change of the protocol definition in the near future.

(3) Network Layer: There is not yet a consensus whether to use virtual connection (CCITT X.25) or datagram (ARPANET IP) model for development of a network protocol. Proposals for these two strategies written by WB4JFI and KA9Q, respectively, are being studied by the Digital Committee. We are in an experimental period to see who gets working code written first and which technique works best in the Amateur Radio environment. There is general displeasure with the slow speed at which this is progressing, mostly due to reliance on volunteers who have only limited time.

(4) Transport Layer: The selection of a transport protocol (whether along the lines of CCITT X.224 or ARPANET TCP) is directly related to the network protocol.

(5) Session Layer: No work has been started.

(6) Presentation Layer: No presentation-layer protocol has been written. To date, design of presentation (command/response) syntax has been done by individuals writing software for various TNCs, the most popular one being that written by NK6K for TAPR. The Digital Committee favors a protocol based on CCITT X.3, X.28 and X.29. VE7APU wrote such a proposal which appears in the Fourth ARRL Amateur Radio Computer Networking Conference proceedings. He is now drafting a protocol definition for consideration of the Digital Committee.

(7) Application Layer: No formal work has been done by the Digital Committee except to begin studying the CCITT X.400 suite of message-transfer protocols. WØRLI has written a computer-based message system (CBMS) program with automatic message forwarding between like systems for the TAPR TNC; a

number of stations in the United States and elsewhere are using his software. A number of amateurs have been working on a binary file-transfer programs. Several amateurs have operated remote CP/M (RCPM) systems. Some experimentation with transfer of weather data is in progress in Florida and around Minneapolis-St. Paul. WB4APR wrote a program to keep track of people and horses for endurance races. This is only a tiny sampling of what is to come in packet-radio applications. Much work remains.

3. Guiding Principles: At its September 1984 meeting in Newington, CT, the Digital Committee agreed on the following groundrules for development of an amateur packet-radio network:

a. A user should need only a TNC to access the network.

b. The network should be easy to operate.

c. The network should support a wide variety of media (HF, VHF, satellite, microwaves, meteor scatter, etc.).

d. The network should remain amateur in spirit.

e. The network should not be highly centralized. The network should function anarchistically.

f. The network should work when commercial networks are down; in the event of emergency, the network should still be available.

g. Network users should be able to specify their needs (for example, a choice of speed over reliability).

h. The network should be able to resist jammers.

i. The network should be able to take advantage of new stations when they come on the air, and should not be crippled by stations leaving the air.

j. The network should support traditional amateur operating modes, rather than forcing amateurs to change their habits.

k. Both real-time and store-and-forward operations should be supported.

l. Controlled broadcast, or alert should be available.

m. Round-table operation should be supported.

n. There should be a network directory available on the air.

o. Fault detection and isolation should be easy.

p. The network should function well in various geographical regions.

q. There should be a mechanism for monitoring the performance of the network.

r. There should be no "passwords" or other "authentication."

s. The network should be data transparent; whatever data is sent from the source should be received unchanged at the destination.

t. The network should be global.

u. The goals set for the network should be attainable within the limited, amateur resources.

v. It should be possible to positively identify nodes.

w. Network hardware and software should be modular.

x. Funding should be sought from outside foundations.

z. Connections should be traceable.

aa. The network should be interoperable with other networks.

bb. The network should exercise some control over users (i.e., routing connections around congestion, limiting traffic.)

cc. The network should be able to accommodate connections with large volumes of traffic flowing in only one direction, with large volumes in both directions and with small volumes in both directions.

dd. We must not underestimate the cost of creating the network.

ee. We must keep the cost of the end-user nodes down.

4. <u>What Industry Could Do to Help Develop Packet Radio</u>:

a. Produce an assembled-and-tested TNC/PAD that will sell for well under U.S. $200. The one to beat, at the moment, is the TAPR TNC 2. Perhaps it is too early for this, but the key to reducing cost may lie in development of an LSI chip to do the packet assembly/disassembly. Any new TNC should comply with the AX.25 link-layer protocol. Designers may wish to examine VE7APU's paper on X.3/28/29 before designing presentation-layer command/response syntax. Portable operation is desirable and

suggests a 12-V power input in addition to use of ac mains (117/234 V, 50-60 Hz).

b. Give serious consideration to reduction of radio-frequency interference (both ingress and egress) in the design of new digital equipment. Very quiet TNC/PADs are needed for weak-signal work.

c. Offer some high-performance modems.

(1) If a modem is built into the TNC/PAD, it should be capable of

(a) Bell 202 for 1200 Bd. (This is the main mode for VHF FM. To be universal, those in the rest of the world may prefer CCITT V.23. A single chip, the Am7910, will do both, including Bell 103 and V.21.)

(b) Bell 103 for up to 300-Bd HF via an SSB transceiver. (For universality, V.21 may also be considered for use outside North America. See above comment.)

(c) 600-Hz shift FSK. (I note that this is used in the Kenwood digitally coded squelch system and believe that modem chips are readily available for this shift. The rationale for 600-Hz shift is given in my paper in the First ARRL Amateur Radio Computer Networking Conference proceedings. I believe this shift is needed for 1200-Bd HF operation, should the FCC permit it in future.)

(2) A modem external to the TNC is needed to optimize packet-radio operation via OSCAR 10. None of the types mentioned above is considered adequate. Any such modem must use a robust modulation/demodulation scheme capable of working with a medium that has 19 dB signal-to-noise floor ratio at best. Preferably, it should have automatic frequency acquisition and Doppler correction.

(3) It is understood that JAS-1 will require special modems. I do not yet have the details and would like to have them to share with the Digital Committee. It would also be desirable to have a technical article for publication in QST on this subject, hopefully with construction details on a compatible modem. Manufacturers may wish to consider producing a modem for JAS-1 operation.

(4) PACSAT, which will probably be launched a year later than JAS-1, will also need special modems. I would like to see the same treatment as suggested above for JAS-1. I have been involved in preliminary discussions concerning the PACSAT modulation/demodulation scheme but believe that the final determination is in the hands of the University of Surrey, U.K.

(5) Perhaps this is asking too much but some thought should be given to a single modem design capable of communicating with all of the above satellites using packet radio.

(6) Modems for 9600-Bd operation within a 20-kHz bandwidth will be needed. One would hope that any commercially manufactured modems will be compatible with those in use at the time of marketing. The Digital Committee has not yet established a standard. The leading candidate for a 9600-Bd modem design is that by K9NG to be kitted by TAPR. The Digital Committee will welcome other designs and/or proposals for a 9600-Bd modem standard.

(7) Modems for higher speeds (56 or perhaps 64 kbit/s) within a 100-kHz bandwidth will be needed in the 1986/1987 timeframe. Experimental designs are encouraged, and the Digital Committee will consider proposals for standardization. New TNC/PAD equipment capable of supporting at least two full-duplex ports will likely be required.

(8) Eventually, we will need even higher speed modems, probably on the order of 1.544 Mbit/s. Designs and standards proposals will be welcomed.

d. Take turnaround (transmit/receive and receive/transmit switching) time into consideration when designing new radio transceivers. Where turnaround time for existing transceivers is excessive, issue modification information to interested amateurs. QEX, The ARRL Experimenter's Exchange, would be a good medium for modifications. The Digital Committee has not yet formally adopted a standard for acceptable turnaround time, but there appears to be a consensus that 20 ms would be satisfactory for most packet-radio applications at speeds up to 1200 Bd. (Note that 20 ms is also in the right range for AMTOR and Morse QSK.) For packet radio, 9600 Bd is probably the cross-over point where 20 ms might be acceptable for existing designs but 1 ms would be a better number for fresh designs. Certainly, for higher speeds, such as 56 kBd or 1.544 MBd, where transceivers are used a turnaround time of 1 ms is suggested. It is expected that future intercity trunks will lean toward full-duplex operation, so turnaround time is not a consideration.

e. For radio equipment you manufacture, provide audio characteristics such as frequency response and group/envelope/transmission delay. Interface designers need to know these characteristics in order to determine the type of equalization required.

f. For radio equipment, consider providing all inputs/outputs to packet-radio AF modems on the back panel at fixed voltage levels independent of any front-panel control settings. A standard interface would be desirable.

g. For VHF/UHF radio equipment, consider adding input/output ports at intermediate frequencies for RF modems. This is difficult to do unless there is a standard IF, such as 10.7 or 21.4 MHz, that would permit RF modems designers to work only with one frequency. Again, it would be desirable to have a standard interface.

h. Give extra consideration to frequency stability of radio equipment to be used for packet, particularly in the SSB mode. Frequency stability should be good enough to permit automatic unattended operation of the radio and still remain within the modem filter passband.

i. Consider building 220-MHz radio transceivers that are compatible with packet radio operation from 1200 through 56 Bd. That would mean that the radio would work with both AF and RF modems.

5. An Invitation: The Digital Committee invites correspondence with Amateur Radio industry, groups and individuals concerning the development of packet-radio standards.

For the ARRL Digital Committee,

Paul L. Rinaldo

Paul L. Rinaldo, W4RI
Chairman

FILE COPY
RECEIVED
JUN 26 1985
FCC
Office of the Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Amendment of Part 97 of) PR Docket No. 85-105
the Commission's Rules to)
Permit Automatic Control of)
Amateur Radio Stations)

To: The Commission

COMMENTS OF
THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

The American Radio Relay League, Incorporated (the "League"), the national association of amateur radio operators licensed by the Commission, hereby respectfully submits its Comments[1/] in response to the Notice of Proposed Rule Making (the "Notice"), FCC 85-169, 50 Fed. Reg. 15196, released April 11, 1985. The Notice is based on the League's Petition (RM-4879), which requested amendment of the Amateur Radio Service Rules to permit automatic control of amateur digital communications above 30 MHz. In response to the proposal contained in the Notice, the League states as follows:

1/ These Comments are filed but one day late (albeit within the Reply Comment period). Good cause exists for this brief delay in submission of the same as explained in the Petition for Leave to Submit Late-Filed Comments filed contemporaneously herewith.

1. The League reaffirms its proposal that automatic control of digital communications be permitted on all amateur frequencies above 30 MHz as outlined in its Petition. In the Notice, the Commission has built upon the League's request, proposing that "any amateur station may be under automatic control, except where transmitting on frequencies below 29.5 MHz." In order to carry out its broader proposal, the Commission proposes to modify its Rules dealing with third-party traffic.

2. It is unfortunate that the Commission has introduced the issue of third-party traffic into this proceeding. It detracts from the primary purpose expressed in the Notice of keeping the amateur service abreast of technological developments such as computer-based message systems (CBMS) and other digital technologies. The proposed third-party Rules also impose unnecessary and onerous restrictions on the development and operation of digital communications networks. In fact, the proposal as presented in the Notice will not allow normal operation of CBMSs, which is contrary to one of the Commission's goals as stated in ¶3 of the Notice.2/ What is supposedly allowed radio amateurs by permitting automatic control is at the same time

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2/ "Our goal is to keep the amateur service abreast of technological developments and to utilize new technology, such as CBMS, where appropriate. . . ." (Notice at ¶3.)

taken away by a proposed blanket prohibition from transmitting third-party traffic by automatically controlled stations[3/] as explained below.

3. The issue of third-party traffic on automatically controlled amateur stations first came to the fore in 1978. Amateur repeater stations were (and still are) permitted to be operated under automatic control.[4/] Many amateur operators at that time were just then discovering the value of interconnecting repeater stations with the public telephone system, particularly to allow user stations direct telephone access to emergency services such as fire and police departments. The device enabling this interconnection became known as an "autopatch," its name derived from the fact that it could, on demand, automatically "patch" a user station to the telephone system without the intervention of the repeater station operator. As more of these devices became operational, the casual use of autopatches increased. Their use

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3/ Proposed §97.80(c) reads as follows:

> "(c) No amateur radio station may be operated under automatic control while transmitting third-party traffic."

Proposed §97.114 would amend that rule by the addition of a new paragraph (d) that would prohibit "(d) Third-party traffic from any amateur radio station under automatic control."

4/ According to §97.3(m) of the Rules, "Automatic control means the use of devices and procedures for control so that a control operator does not have to be present at the control point at all times."

became widespread in certain parts of the country, and the Commission, concerned with the potential abuse of amateur frequencies, reminded radio amateurs that unlicensed individuals must not be permitted unsupervised access to amateur frequencies or telephone interconnection authority would be eliminated in the Amateur Radio Service.

4. Specifically, on April 5, 1978, the Commission released a News Release which, in reference to autopatches, declared that "Section 97.79(d) states that 'the licensee of an Amateur station may permit any third party to participate in Amateur radio communication from his station, provided that a control operator is present and continuously monitors and supervises the radio communications to insure compliance with the Rules.'"5/ The Commission in the same notice also stated that §97.79(d) clearly "prohibited autopatching and reverse autopatching through automatically controlled repeater stations and required a control operator to be on duty at all times during these operations."

5. What the Commission was seeking to guard against then was the origination and introduction of communications into the

5/ See News Release, Report No. 2028, Mimeo No. 8832, October 25, 1978.

amateur radio medium by unlicensed individuals. Autopatches, particularly reverse autopatch,[6/] create a situation fraught with the potential for abuse if left unsupervised by a control operator. Unlicensed individuals are not familiar with the restrictions against commercial use of amateur radio, nor with good amateur practices regularly employed by the licensed fraternity.[7/] The threat was a redefinition of the character of the Amateur Radio Service.

6. The Commission misapplies this point in the instant proposal, however, by seeking to prohibit "third party traffic from any amateur radio station under automatic control."[8/] A similar potential for abuse by unlicensed individuals in a digital amateur radio system exists <u>only</u> at the point where the third-party traffic is originated and introduced into the amateur radio medium. It is necessary to require a control operator at this stage only. This control operator will guard against the potential abuse of amateur frequencies in a digital system just

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6/ Reverse autopatches allow any individual who knows the correct phone number to initiate an amateur transmission on a repeater or other station.

7/ *See*, for example, "Phone Patch and Autopatch Guidelines" in *The FCC Rule Book* (published by the League) 3d ed., 1984, pp. 7-7 and 7-8.

8/ Proposed §97.114(d). Also see proposed §97.80(c).

as effectively as the control operator on duty at a voice repeater station when an autopatch is accessed. To impose the additional burden of a control operator at every point along the digital system, be it at a CBMS site or at every packet "digipeater" along the path to the message's destination is unnecessary. Such requirement, in fact, would severely curtail the use of the developing digital technologies because the burden on control operators would be nearly impossible to shoulder. For example, messages on a packet radio repeater are received at a rate of 1200 words per minute, and retransmitted immediately at that same rate. This would require a control operator to examine each packet at a rate of 600 words per minute to keep up with the throughput capability of such a repeater. Furthermore, speeds higher than 1200 words per minute are authorized, and technology is advancing toward higher and higher speeds.

7. The proposed blanket prohibition of third-party traffic on all automatically controlled stations would also have adverse effects that extend beyond the digital communications modes. It is common practice for radio amateurs to conduct nets for the purpose of exchanging and relaying third-party traffic. During a net, radio amateurs coordinate their communications on one or more frequencies at a pre-established time. On the very high frequencies, nets are commonly conducted through repeater stations, many of which are automatically controlled. The Rules already require two control operators, one each at the sending and receiving stations. Indeed, if the communications between

the stations exchanging third-party traffic were accomplished directly (i.e, without going through a repeater), there would be no further inquiry. However, the happenstance of the traffic being automatically relayed through a repeater would, according to the Commission's proposal, require yet a _third_ control operator. The repeater station would not be able to operate under automatic control because "no amateur radio station may be operated under automatic control while transmitting third-party traffic."9/

8. We urge the Commission to modify its proposal so as not to impose a blanket prohibition of third-party traffic on stations operating under automatic control. We believe that the best way to achieve the goal of promoting the developing technologies in digital communications is to leave §97.79 intact with the possible exception of clarifying §97.79(d) to read as follows (proposed addition is underlined):

> (d) The licensee of an amateur radio station may permit any third party to participate in amateur radio communication from his station provided that a control operator is present and continuously monitors and supervises the radio communication to insure compliance with the rules. _Participation means the origination, introduction or reintroduction of a communication into the amateur radio medium by a third party._

9/ Proposed §97.80(c).

The proposed addition of this language to §97.79(d) has the added benefit of clarifying that a control operator is required during operation of simplex autopatches.

9. It is further urged that proposed Rule §§97.80(c) and 97.114(d) not be adopted, and that the Commission instead adopt the wording of §97.80, as originally proposed by the League, as follows:

> §97.80 Automatic Control of Digital Communications.
>
> Amateur Radio Stations may be operated under automatic control on frequencies above 30 MHz when utilizing digital communications pursuant to §97.69, provided that the control functions include (i) adequate provision for detection of transmitter malfunction and discontinuance of transmitter operation in the event such malfunction is detected; (ii) devices installed and procedures implemented to ensure compliance with the rules when a duty control operator is not present at a control point of the station. Upon notification by the Commission of improper operation of a station under automatic control, operation under automatic control shall be immediately discontinued until all deficiencies have been corrected.

THEREFORE, the foregoing considered, the League recommends that the Commission extend automatic control to amateur digital communications above 30 MHz. The League also requests that the proposed blanket prohibition of third-party traffic transmitted on automatically-controlled stations not be adopted, and it urges

that §97 be amended by the adoption of §97.80 as originally proposed by the League.

Respectfully submitted,

THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED

225 Main Street
Newington, CT 06111

By: Christopher D. Imlay
Christopher D. Imlay,
Its Counsel

Booth, Freret & Imlay
1920 N Street, N.W., Suite 520
Washington, D.C. 20036
(202) 296-9100

June 26, 1985

July 12, 1985

To : Ad Hoc Committee on Amateur Radio Digital Communication

Subject: Networking

It seems to me that we are progressing at a snail's pace with networking. There may be 10,000 packet users by this time next year. If all they have is level 2, how long will they be happy -- particularly if they have some idea of packet's potential?

Last September, we agreed to do a number of things to get network experimentation going. A number of foundational things such as the FAD board and dual-port digipeater software have been accomplished.

Are we all looking to Terry and Phil to solve this for us? If that's the best plan, then what can the rest of us do to help them concentrate on networking and shun all other ill-conceived pastimes (computers, women, etc.)?

Is it time that we identified other possible contributors to the process. Who? How?

Please let me know by electronic or physical mail what I or anyone else can do to move things along a little faster? Until I get a handle on how fast things are moving, or can move, it does not appear to be productive to set the next Committee meeting date.

73,

Paul

Paul L. Rinaldo, W4RI
Chairman

July 12, 1985

To : Ad Hoc Committee on Amateur Radio Digital Communication

Subject: 160-Meter Band Planning

Attached is an advance copy of an article by John Lindholm as it will appear in the August issue of **QST**.

Please try to get your groups to give us some input where digital communications (RTTY and packet) ought to go within the 160-meter band.

73,

Paul L. Rinaldo, W4RI
Chairman

Subject: Service Marking AX.25

At the recommendation of the ARRL Ad Hoc Committee on Amateur Radio Digital Communication and with the approval of President Price, Counsel Imlay has applied to the Patents and Trademarks Office for a Service Mark for AX.25. See attached application.

Effective immediately, any reference to AX.25 should be immediately followed by SM pending, which may be written: AX.25 SM pend. To fulfill this requirement, the SM pending notation need be made once at the beginning of an article... certainly not any more than once on any given printed page.

PR 6/28/85

LAW OFFICES OF
BOOTH, FRERET & IMLAY
SUITE 520
1920 N STREET, N.W
WASHINGTON, D.C. 20036

ROBERT M. BOOTH, JR (1911-1981)
JULIAN P. FRERET
CHRISTOPHER D. IMLAY

TELEPHONE
(202) 296-9100

CARL H. IMLAY
OF COUNSEL

June 20, 1985

Trademark Application Section
Patents and Trademarks Office
Department of Commerce
Washington, D.C. 20231

Attn: Mr. Leon Jackson, Supervisor

Re: Application for Service Mark.

Dear Mr. Jackson:

Enclosed is an application for a service mark on behalf of the American Radio Relay League, Incorporated. The service provided refers to a protocol for a mode of communications among amateur radio operators. Included in this application are all the items required pursuant to the May, 1984 General Information Packet put out by your office; specifically:

1. the written application;

2. a drawing of the mark;

3. five facsimiles; and

4. the required fee.

In addition (as per your telephone conversation of June 19 with a member of my staff), I am also enclosing one copy of the actual protocol. Though not apparently necessary, I agree with you that submission of the actual document may reduce the chances for any possible delay in the processing of this application. If any questions arise concerning this application, please contact the undersigned.

Yours very truly,

Christopher D. Imlay

CDI:fjm
Enclosure
cc: David Sumner

TRADEMARK APPLICATION, PRINCIPAL REGISTER, WITH DECLARATION (Corporation)	MARK (identify the mark) Service Mark CLASS NO. (if known)

TO THE COMMISSIONER OF PATENTS AND TRADEMARKS:

NAME OF CORPORATION [1]
The American Radio Relay League, Incorporated

STATE OR COUNTRY OF INCORPORATION
Connecticut

BUSINESS ADDRESS OF CORPORATION
225 Main Street, Newington, CT

The above identified applicant has adopted and is using the trademark shown in the accompanying drawing[2] for the following ~~goods~~: services: As identification for a protocol on amateur packet radio.

and requests that said mark be registered in the United States Patent and Trademark Office on the Principal Register established by the Act of July 5, 1946.

The trademark was first used on the ~~goods~~ services[3] on March 1, 1983 (date); was first used on the ~~goods~~ services[3] in interstate and foreign (type of commerce) commerce[4] on October 1, 1984 (date); and is now in use in such commerce.

5

The mark is used by applying it to[6] the protocol of a mode of communications.

and five specimens showing the mark as actually used are presented herewith.

7

David Sumner
(name of officer of corporation)

being hereby warned that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any registration resulting therefrom, declares that he/she is

Executive Vice President
(official title)

of applicant corporation and is authorized to execute this instrument on behalf of said corporation; he/she believes said corporation to be the owner of the trademark sought to be registered; to the best of his/her knowledge and belief no other person, firm, corporation, or association has the right to use said mark in commerce, either in the identical form or in such near resemblance thereto as may be likely, when applied to the goods of such other person, to cause confusion, or to cause mistake, or to deceive; the facts set forth in this application are true; and all statements made of his/her own knowledge are true and all statements made on information and belief are believed to be true.

The American Radio Relay League, Inc.
(name of corporation)

By David Sumner
(signature of officer of corporation, and official title of officer)

June 14 1985
(date)

REPRESENTATION

If the applicant is not domiciled in the United States, a domestic representative must be designated. See Form 4.4.

If applicant wishes to furnish a power of attorney, see Form 4.2. An attorney at law is not required to furnish a power.

FOOTNOTES

1 If applicant is an association or other similar type of juristic entity, change "corporation" throughout to an appropriate designation.

2 If registration is sought for a word or numeral mark not depicted in any special form, the drawing may be the mark typed in capital letters on letter-size bond paper; otherwise, the drawing should be made with india ink on a good grade of bond paper or on bristol board.

3 If more than one item of goods in a class is set forth and the dates given for that class apply to only one of the items listed, insert the name of the item to which the dates apply.

4 Type of commerce should be specified as "interstate," "territorial," "foreign," or other type of commerce which may lawfully be regulated by Congress. Foreign applicants relying upon use must specify commerce which Congress may regulate, using wording such as commerce with the United States or commerce between the United States and a foreign country.

5 If the mark is other than a coined, arbitrary or fanciful mark, and the mark is believed to have acquired a secondary meaning, insert whichever of the following paragraphs is applicable:

a) The mark has become distinctive of applicant's goods as a result of substantially exclusive and continuous use in ______________________ *(type of commerce)* commerce for the five years next preceding the date of filing of this application.

b) The mark has become distinctive of applicant's goods as evidenced by the showing submitted separately.

6 Insert the manner or method of using the mark with the goods, i.e., "the goods," "the containers for the goods," "displays associated with the goods," "tags or labels affixed to the goods," or other method which may be in use.

7 The required fee of $175.00 for each class must be submitted. (An application to register the same mark for goods and/or services in more than one class may be filed; however, goods and/or services, and dates of use, by class, must be set out separately, and specimens and a fee for each class are required.)

Name:	The American Radio Relay League, Incorporated
Address:	225 Main Street, Newington, CT 06111
Date of First Use:	March 1, 1983 (Domestic); October 1, 1984 (Int'l)
Service:	Protocol of a Mode of Communications

AX.25

AX.25 AMATEUR PACKET-RADIO LINK-LAYER PROTOCOL

VERSION 2.0
OCTOBER 1984

10701 Five Forks Road
Frederick MD 21701

301-293-2448 home
703-689-6556 work
telex: 257537 eric ur

1985 July 18

ARRL Ad Hoc Digital Committee
c/o Paul Rinaldo
American Radio Relay League
225 Main Street
Newington CT 06111

Dear gentlemen,

We are all struggling with the great questions of network layer protocol before us. Presently, there are two camps of opinion: the X.25 camp and the IP/TCP datagram camp. I would like to propose a third alternative.

The CCITT has published in the Red Book (1984) portions of a new signalling protocol for the network layer. This work is part of the ongoing activities on integrated services digital networks. The new signalling protocol is Recommendation Q.931.

Q.931 has several merits worthy of our attention:

a) It's agreements are clearly defined. The protocol is described in state description language (SDL). SDL provides an unambigous explanation of the protocol's message flow. Additional state transition tables explain how abnormal protocol events are to be handled. The resultant description is far more precise than a prose text could hope to be.

b) It's symmetrical. The operation of the protocol is indifferent as to public network subscriber or network switch. This is a major design objective.

c) It is intended for application both between a terminal and the network, between two terminals, or between two network switches. No change in the protocol occurs in any of these scenarios. This uniformity would allow its general application throughout the packet radio community.

d) It is modular in format. Signalling messages are designed to be built of "information elements". These elements are self-defined fields containing an indication of type of contents and overall length. New information may be included by simply appending new information elements. The lengths are not fixed; fields may be made as long or short as required for the specific situation at hand. Information elements of no interest to a particular device can be easily ignored and passed over in processing. This allows future upgrades to occur with no impact on existing equipment.

e) It is modular in procedure. There is a central core to the protocol. Additional capabilities can be added with additional signalling message sequences for equipment that chooses to support such enhancements.

f) The protocol controls both packet-switched (virtual) calls and circuit-switched calls. While we have an immediate interest in packet operation, the ability to allocate radio channels and switch them dynamically may be of future interest to us.

g) The protocol provides compatibility and "bearer service" information. The compatibility information exchanged between two users will allow them to configure their equipment (e.g., higher layer protocols) compatibly before communications begins. Multiple types of information flows may be identified as "bearer services": packet data, voice, video, etc. Again, while our immediate interest is packet data, future possibilities exist and could be exploited.

h) Multipoint operation is supported. This includes multi-point call delivery to any compatible destination interested in receiving the call, as well as multi-point connections (conference, broadcast, and assymetrical arrangements).

i) Q.931 is designed to operate on a layer 2 protocol very similar to AX.25. The CCITT describes that protocol in Recommendations Q.920 and 921. It is HDLC based, uses extended address fields, allows multiple devices to share the same channel, and is generally symmetrical. AX.25 remains superior for our application; I point out this fact only to illustrate that Q.931 can operate over AX.25 links without modification, because of the similarity of AX.25 links to Q.921 links.

j) Specific coding space has been set aside for network-specific messages and information elements. This means that the amateur radio community can define additional signalling messages, or information to appear in messages, as it sees fit without the fear of subsequent improvements to the standard wiping out our agreements.

l) Q.931 can be used on channels which employ other protocols. Each Q.931 signalling message begins with a

protocol discriminator to distinguish it from other protocols present on the circuit.

m) Q.931 is the subject of intense work in the telecommunications industry. It is not a fixed object, and we have an opportunity to influence its development. Indeed, there is an opportunity for amateurs to be among the first implementers.

n) Many domestic and overseas chip manufacturers are preparing silicon VLSI implementations of Q.931 and its companion layer 2 protocol Q.921. While these will be initially expensive, there is an opportunity for us to exploit this chips at a later date. The expected market for these chips internationally is nearly 1 billion by the end of this century, so costs will come down dramatically during the next decade.

Perhaps your appetite has been whetted. Rather than dump a 200 page document into the mailing system, I intend to extract relevant material and feed it to you in dribs and drabs as quickly as I can.

I also intend to share with you some further thoughts about the very knotty, intertwingled problem of routing and addressing in our proposed "anarchistic" network. These thoughts will be independent of any choice of network protocol.

Regards,

Eric L. Scace

Eric L. Scace K3NA

MINUTES OF THE 1985 SECOND MEETING OF THE BOARD OF DIRECTORS
THE AMERICAN RADIO RELAY LEAGUE, INC.
July 25 - 26, 1985

AGENDA:

1) Roll Call
2) Moment of Silence
3) Consideration of the agenda for the meeting
4) Approval of Minutes of 1985 Annual Meeting
5) Oral reports of the officers
6) Receive reports and consider recommendations of the committees
7) Consideration of ARRL Position Relative to PR Docket 85-22, Repeater Coordination
8) Directors' motions

1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc., met in second session at the Parkview-Hilton Hotel in Hartford, Connecticut, on July 25, 1985. The meeting was called to order at 8:34 A.M., EDT, with President Larry E. Price, W4RA, in the Chair and the following directors present:

Thomas B.J. Atkins, VE3CDM, Canadian Division;
Frank M. Butler, Jr., W4RH, Southeastern Division;
Lys J. Carey, KØPGM, Rocky Mountain Division;
Linda S. Ferdinand, N2YL, Hudson Division;
Thomas W. Frenaye, K1KI, New England Division;
Paul Grauer, WØFIR, Midwest Division;
Clyde O. Hurlbert, W5CH, Delta Division;
Mary E. Lewis, W7QGP, Northwestern Division;
Edmond A. Metzger, W9PRN, Central Division;
Gay E. Milius, Jr., W4UG, Roanoke Division;
Tod Olson, KØTO, Dakota Division;
Fried Heyn, WA6WZO, Southwestern Division;
William J. Stevens, W6ZM, Pacific Division;
Hugh A. Turnbull, W3ABC, Atlantic Division;
Raymond B. Wangler, W5EDZ, West Gulf Division;
George S. Wilson, III, W4OYI, Great Lakes Division.

Also in attendance as members of the Board without vote were Leonard M. Nathanson, W8RC, First Vice President; Garfield A. Anderson, KØGA, Vice President; Jay A. Holladay, W6EJJ, Vice President; Richard L. Baldwin, W1RU, International Affairs Vice President; and David Sumner, K1ZZ, Executive Vice President. Also in attendance at the invitation of the Board as observers were the following Vice Directors: Richard P. Beebe, K1PAD, New England Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; Howard S. Huntington, K9KM, Central Division; John C. Kanode, N4MM, Roanoke Division; Harry MacLean, VE3GRO, Canadian Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Marshall Quiat, AGØX, Rocky Mountain Division; Richard Ridenour, KBØZL, Midwest Division; Robert P. Schmidt, W5GHP, Delta Division; and Allan L. Severson, AB8P, Great Lakes Division. There were also present Harry J. Dannals, W2HD, President

Emeritus; Honorary Vice Presidents Robert York Chapman, W1QV, Jean A. Gmelin, W6ZRJ, and J. Lincoln McCargar, W6EY; Past President Carl L. Smith, WØBWJ; Secretary Perry Williams, W1UED; Treasurer James E. McCobb, K1LLU; Counsel Christopher D. Imlay, N3AKD; Canadian Counsel Robert Benson, Q.C., VE2VW; Executive Associate W. Dale Clift, NA1L; Stephen C. Place, WB1EYI, Volunteer Resources Manager; Paul Rinaldo, W4RI, Publications Manager; William L. Lazzaro, N2CF, Development Manager; and Michael R. Zeigler, Controller.

2) The assembly observed a moment of silence in recollection of amateurs who have passed away since the previous Meeting of the Board, especially ARRL co-founder Clarence Tuska, ex-1WD, ex-1ZT.

3) The Chair recognized Mr. Wilson, who introduced the new Vice Director from the Great Lakes Division, Mr. Severson (applause). The Chair recognized Mr. Grauer, who introduced the new Vice Director from the Midwest Division, Mr. Ridenour (applause). The Chair recognized Mr. Atkins, who introduced the Vice Director from the Canadian Division, Mr. MacLean, attending the Board Meeting for the first time (applause). The Chair recognized Mr. Gmelin, who introduced Honorary Vice President McCargar, attending a Board Meeting for the first time since 1950 (applause).

4) On motion of Mr. Olson, seconded by Mr. Stevens, it was VOTED that, with the addition of agenda item 6e) "Report of the Executive Committee" and 6k) "Report on Division surveys," the agenda is adopted as presented.

5) On motion of Mr. Olson, seconded by Mr. Turnbull, it was VOTED to approve the Minutes of the 1985 Annual Meeting in the form in which they appeared in the March 1985 issue of QST.

6) Moving now to agenda item 5, supplementary oral reports of the officers were presented. At 8:47 A.M., staff members Clift, Lazzaro, Place, Rinaldo, and Zeigler were temporarily excused from the meeting. Mr. Price presented his oral report covering certain aspects of ARRL's Washington representation; the ARRL Development Program to increase the numbers of amateurs and of League members; and the forthcoming meeting in Hartford of the International Amateur Radio Union's Region 2 Executive Committee. At 9:47 A.M., the staff returned to the meeting.

7) First Vice President Nathanson presented his report covering the convention of the National Cable Television Association which he attended; preparation of a revised employee manual; federal preemption; a program to reactivate members who have not renewed ARRL membership; the Young Astronaut Program; ARRL forums at conventions; his work on the Administration and Finance Committee; and the ARRL request to FCC for enhancement of Novice Class privileges.

8) Vice President Anderson reported on his activities for the past six months, and noted a willingness of clubs to accept the challenge and develop ways to increase the numbers of radio amateurs. He also reported on his meeting with the Publications Committee and praised the work of the Publications Group staff.

9) Vice President Holladay's report included his attendance at the western conference of the Armed Forces Communications and Electronics Association; his work on the Membership Services Committee; and the memorial service for the late Don Wallace, W6AM.

10) Next came the report of Mr. Baldwin, covering his activities as Vice President for International Affairs and President of the International Amateur Radio Union (IARU). Organizational activities included participation in the IARU Region I HF Working Group meeting in Germany in March and the Region I Executive Committee meeting in Yugoslavia, in April. Preparation for a future World Administrative Radio Conference (WARC) was among subjects discussed during a trip to Singapore for the Asia Telecom 85 exhibit and forum. In June Mr. Baldwin taught a course, "Amateur Radio Administration" under the auspices of the United States Telecommunications Training Institute, for five telecommunications officials from Ghana, Dominica, Tonga, Tanzania, and Taiwan. Meetings planned for the second half of the year include the IARU International Study Group on the Intruder Watch, Geneva; attendance at the World Administrative Radio Conference on the use of Geostationary Satellite Orbit (WARC-ORB 85); participation in the 75th Anniversary of the Wireless Institute of Australia; a meeting of the IARU Administrative Council; and the sixth Triennial Conference, IARU Region 3, in Auckland, New Zealand. Mr. Baldwin also noted the forthcoming meeting of the IARU Region 2 Executive Committee immediately following the Board Meeting, in the same location. The Board was in recess from 10:15 to 10:55 A.M.

11) Executive Vice President Sumner presented an extensive written and oral report on the activities of the Headquarters during the first half of the year. The ARRL budget for 1985 predicts a small deficit; at the half year point, the loss was somewhat less than anticipated. A membership promotion campaign has produced an increase of some 6,000 members in the first half year. A mailing to former members will be made in August and the Club Challenge program will get renewed emphasis in September when clubs return to normal activity. With respect to the parallel effort to increase the number of amateurs, the total licensee numbers have not yet turned upward. Development Group involvement in Shuttle Mission 51-F has delayed the start of a formal recruitment program, but of course, the excitement surrounding the space mission could itself bring in some new amateurs in due time. The report dealt at great length with activities within the Publications Group, especially focusing on the new License Manuals which have been very well received by the amateur population. The report also covered several items related to QST, including wider distribution in retail sales, and scheduled appearance of the magazine among the complimentary reading material on flights of Ransome and Piedmont aircraft. A progress report was rendered on actions stemming from the January Board Meeting, and on studies which the Executive Vice President performed at the request of the Board, including the feasibility of ARRL providing assistance to FCC in callsign issuance. The assembly was in recess for lunch from 12:29 to 1:33 P.M., reconvening with all persons hereinbefore mentioned present.

12) Continuing Agenda item 5, Treasurer McCobb presented a brief oral report focusing on the condition of ARRL's surplus at the end of the first half year, with comparisons to year-end 1984 and last June.

13) Counsel Imlay presented an extensive report, covering implementation of the 24 MHz band; frequency coordination of repeaters in Docket 85-22; proposed expansion of frequencies available for auxiliary operation, Docket 85-215; amendment of Part 15 for low-power communication devices; increased cable signal leakage, Docket 85-38; amendment of the Rules to prohibit disqualified persons from participating in third party communications, Docket 85-51; regulations concerning amateur operator examinations by volunteers, Docket 85-21; radiolocation in 1900-2000 kHz, Docket 84-874; amateur microwave allocations, Docket 85-23; the FCC proposal to permit land mobile in 421-430 MHz in Detroit, Cleveland and Buffalo, Docket 85-113; 7 MHz broadcasting in Region 3, Docket 84-706; automatic control of Amateur Radio stations, Docket 85-105; 7 MHz telephony in the Carribean, Docket 85-104; maintenance of amateur operator question pools, Docket 85-196; F1 emissions in the 160 meter band, Docket 84-959; PRB-1, the ARRL request for limited Federal preemption of regulation of amateur antenna structures; and status reports on local litigation involving amateurs.

14) Canadian Counsel Benson presented his report covering trademark matters; corporate activities of the Canadian Radio Relay League; tower restrictions and radio frequency interference; contact with the Department of Communications; customs duty matters; and his work with the Ad Hoc Committee on Strengthening CRRL.

15) Mr. Grauer, as President, presented a brief report of the ARRL Foundation, including recent scholarship activity.

16) Moving on to agenda item 6, the report of the Administration and Finance Committee was presented by Chairman Metzger, covering capital equipment; W1AW renovation; personnel matters; the staff pay structure; and employee policies. It was moved by Mr. Metzger, seconded by Mr. Milius, that the following sentence be added to the end of Bylaw 4: "Members may be permitted to pay dues on an installment basis, in accordance with a schedule and rates as determined by the Executive Vice President and published periodically by QST." After discussion, it was moved by Mr. Butler, seconded by Mr. Grauer, that the matter be laid on the Table, but the motion to Table was LOST, 7 votes in favor to 8 opposed. A roll call vote being required, the results were announced as follows: number of votes cast 16, necessary for adoption 12, ayes 9, nays 7. So the motion to amend the Bylaws was LOST. Those voting in favor were Mrs. Ferdinand, Mr. Frenaye, Mr. Hurlbert, Mrs. Lewis, Messrs. Metzger, Milius, Olson, Stevens, and Wilson. Those voting opposed were Messrs. Atkins, Butler, Carey, Grauer, Heyn, Turnbull and Wangler.

17) It was moved by Mr. Metzger, seconded by Mr. Hurlbert, that Bylaw 6 is revised by striking the text and substituting therefor the following: "6. A member who has not reached the age of 14 may request an annual dues rate equivalent to 20% of the rate set forth in Bylaw 4. A member who has not reached the age of 18 may request an annual dues rate equivalent to 60% of the rate set forth in Bylaw 4. This rate shall not be available for life membership." After discussion, however, Mr. Metzger, with the consent of his second, withdrew the motion.

18) Mrs. Lewis, as Chairman, presented the report of the Membership Services Committee, covering the 160-meter band plan; QST wrapper inserts; Field Organization and administration of awards; awards and contests on 10 and 24 MHz; and advisory committee structure.

19) Mr. Butler, as Chairman, presented the report of the Publications Committee, which recommended that present policies in reference to QST contributions by authors other than staff continue in force. The report also discussed extensively the schedule of publications by ARRL; correspondence letterhead; satellite orbital predictions; propagation charts; question and answer pools on disk; and the YL column in QST. The Board was in recess from 3:15 to 3:42 P.M.

20) Mr. Wilson, as Chairman, presented the report of the Volunteer Resources Committee, covering section news in QST; the Public Service Honor Roll; the new publication, Field Forum; qualifications of Assistant Technical Coordinators; the Volunteer Examining Program; scholarships and awards; administration of field awards; and advisory committee structure.

21) Mr. Price, as Chairman, presented the report of the Executive Committee, concerning contacts with Federal government officials. On motion of Mr. Carey, seconded by Mr. Milius, the following policy was adopted and ordered placed in the Director's Workbook:

POLICY GOVERNING CONTACTS WITH FEDERAL GOVERNMENT OFFICIALS
BY MEMBERS OF THE ARRL BOARD

ARRL Bylaw 31 provides that the President "shall, subject to instruction from the Board of Directors, and with the assistance of the Executive Vice President, represent the League in its relationships with the public and the various governments, governmental agencies and officials with which the League may be concerned and shall be the official spokesman of the Board of Directors in regard to all matters of League policy."

Policies adopted by the Board govern the functioning of the Washington Area Coordinator and League Counsel, and provide for their oversight by the President in their contacts with Federal entities. The Executive Vice President is responsible to the President for contacts made by staff in the performance of their duties. From time to time, assignments involving Federal government contact may be made by the Board to individuals or to Ad Hoc Committees, task groups or task forces; in such cases, the extent of contact authorized will be determined by the terms of reference.

It is important for the policies of the Board to be communicated to Federal government personnel in a consistent manner, and for the League to present a position of unity at all times. Accordingly, the only contact with FCC, congressional and other Federal government personnel which involves, or could be construed to involve, ARRL or amateur radio policy matters, shall be as outlined above.

Board policy prohibits the filing of comments in FCC proceedings by members of the Board, either on their own behalf or on behalf of other organizations. This policy is not to be construed as prohibiting Board members from encouraging the filing of comments by others in support of League positions, or from contacting their own elected government representatives to gain support of League positions.

Expenses incurred while arranging for or engaging in Federal government contacts in contravention of this policy will not be reimbursed by the League.

Further guidelines for the ethical conduct for officers and directors are contained in the Director's Workbook.

22) Mr. Atkins, as Chairman, presented the report of the Ad Hoc Committee on the Strengthening of CRRL. The report focused on technical details of further transfer of membership functions and responsibilities to CRRL as of January 1, 1986 and beyond.

23) Mr. Wilson, as Chairman, presented the final report of the Ad Hoc Committee on Volunteer Monitoring. On his motion, seconded by Mr. Grauer, it was VOTED that the Ad Hoc Committee on Volunteer Monitoring be dissolved with further review of the program assigned to the Volunteer Resources Committee and that the unexpended budget of the Ad Hoc Committee be released to the General Fund.

24) Mr. Turnbull, as Chairman, presented the report of the RFI Task Group, covering review of Headquarters correspondence on cable and general interference problems; the filing of comments opposing relaxation of cable leakage limits; field tests of upstream ingress in residential areas; the American National Standards Institute Ad Hoc Committee C63 dealing with RF immunity; and a planned study of cordless telephones and home security devices by C63.

25) Mr. Wangler, as Chairman, presented the report of the ARRL Committee on the Biological Effects of RF Energy, including preparation of draft ARRL comments in Docket 79-144; review of and reply to an item in the British medical journal, The Lancet; attendance at the Bioelectromagnetics Society meeting in San Francisco; reply comments in Docket 79-144; and guidance by ARRL to its members on the prudent handling of RF energy.

26) Mr. Quiat, as Liaison, presented the report of the Ad Hoc Committee on Amateur Radio Digital Communication, covering the Fourth Amateur Radio Computer Networking Conference in San Francisco; standardizing command and response protocols; progress in development of network protocols; application to register "AX.25" as a Service Mark; cooperation with manufacturers on incorporating packet radio capability in digital communications equipment; and proposals for the Fifth ARRL Amateur Radio Computer Networking Conference, 1986.

27) Mr. Nathanson, as Chairman, presented a brief oral report of the Task Force on Federal Preemption of Tower and Antenna Regulations. Action by FCC in

response to PRB-1, ARRL's request for partial preemption, is expected by mid-autumn. It should be regarded as providing a useful legal tool, rather than as a panacea to solve all problems.

28) Mr. Butler, as Liaison, presented a report of the VHF Repeater Advisory Committee, recommending that ARRL not endeavor to become a national repeater coordinator; that ARRL should continue to offer its assistance to coordinating councils; and that ARRL should file comments in PR Docket No. 85-22 providing for a more clear definition of a repeater coordinator.

29) In the absence of Vice Director Rush Drake, as Liaison, the report of the Contest Advisory Committee was placed on file. It covers the Committee's negative recommendation on a contest code of ethics; the Committee's recommendation that the solicitation of contacts during a contest period by non-Amateur Radio means be prohibited; and other items under review by the Committee.

30) Mr. Kanode, as Liaison, presented the report of the DX Advisory Committee, covering its recommendation that the Pribilof Islands be granted separate-country DXCC status; a recommended change in the wording of DXCC rule 5(b); and other matters under consideration by the Committee. It was moved by Mr. Stevens, seconded by Mrs. Lewis, that the following resolution be adopted:

> WHEREAS, the petition of the Alaska DX Association for separate country status for the Pribilof Islands was submitted to the League in August 1983, and
>
> WHEREAS, the question of separate country status for the Pribilof Islands has remained unresolved for two years creating uncertainty for participants in the DXCC program, and
>
> WHEREAS, it is in the best interest of the League and the DXCC program to resolve this uncertainty in a way that will inject vitality into the DXCC program, and
>
> WHEREAS, the DX Advisory Committee, after lengthy deliberation, has rendered its recommendation that the Pribilof Islands be considered a separate country for DXCC purposes,
>
> BE IT RESOLVED, that the Pribilof Islands be added to the DXCC countries list for contacts after November 15, 1945, with cards to be accepted for credit as soon as is administratively feasible.

After discussion, on motion of Mrs. Ferdinand, seconded by Mr. Heyn, it was VOTED that the matter was laid on the Table. Mrs. Lewis and Mr. Stevens requested to be recorded as opposing the motion to Table.

31) Mr. Beebe, as Liaison, presented the report of the Emergency Communications Advisory Committee focusing on the need for local-level Memoranda of Understanding between ARRL field organization officials and their respective

municipal governments, departments and private agencies. On motion by Mr. Wilson, seconded by Mr. Butler, it was VOTED that (1) the Field Services Department develop a plan to actively promote local Memoranda of Understanding for potential use by the ARES field organization officals following the general guidelines and intent of the 1985 interim ECAC report and (2) the Volunteer Resources Committee will review and recommend such a program to the Board no later than the 1986 Annual Meeting.

32) Mr. Mendelsohn, as Liaison, presented the report of the Public Relations Advisory Committee, covering a pictorial-style pamphlet about amateur radio; development of a slide show as requested by the Board in 1984; promoting amateur licenses among graduates of armed forces communications schools; and preparation of ARRL public service announcements for radio and television.

33) Mr. Olson presented a comparison of statistics derived from surveys conducted in three ARRL divisions. The Board was in recess for dinner from 4:58 to 8:21 P.M., reconvening with all persons hereinbefore mentioned present except Messrs. Baldwin, McCobb, Rinaldo and Zeigler.

34) Turning to agenda item 7 there was extensive discussion of an ARRL position relative to FCC Docket 85-22. The Chair appointed the following as a drafting committee for ARRL's comments in the matter: Vice President Holladay, Chairman, and Messrs. Mendelsohn, Quiat, Severson, and MacLean, with the last as secretary. The Board was in recess for the night at 9:43 p.m., reconvening on the morrow at 8:37 a.m., with all persons hereinbefore mentioned present except Messrs. Lindholm, McCobb, and Zeigler. In addition the members of the Ad Hoc Committee appointed the previous evening were absent from portions of the meeting in order to complete the assigned task with regard to PR Docket 85-22.

35) Turning to agenda item 8, Directors' Motions, on motion of Mr. Wilson, seconded by Mr. Wangler, it was VOTED that the League adheres to the principle that the FCC retain responsibility for all Amateur Radio examination question pools, and that Volunteer Examiner Coordinators be responsible for creating the actual tests therefrom. Counsel will file such comments as may be required with respect to Commission action in conformity with the principle.

36) It was moved by Mrs. Ferdinand, seconded by Mr. Olson, that individuals so designated by Special Service Clubs be permitted to certify and issue the following awards: Worked All States, Five Band Worked All States, VHF/UHF Century Club. On motion of Mr. Hurlbert, seconded by Mr. Olson, it was VOTED to decide the matter by roll call vote. The question was then decided in the affirmative, 9 votes in favor to 7 votes opposed, so the motion was ADOPTED. The following Directors were recorded as voting in favor: Mr. Butler, Mrs. Ferdinand, and Messrs. Frenaye, Grauer, Heyn, Hurlbert, Metzger, Olson and Wilson. The following Directors were recorded as voting opposed: Mr. Atkins, Mr. Carey, Mrs. Lewis, and Messrs. Milius, Stevens, Turnbull, and Wangler.

37) It was moved by Mr. Grauer, seconded by Mr. Frenaye, that the Board authorizes the Executive Vice President to make available to the following field appointees and field volunteers ARRL badges of distinctive design, at reason-

able cost, as follows: a) to the field leadership positions, ARRL-logo callsign badges with a deep green background and same general design as those authorized for the official family, and b) to the Volunteer Examiners and "members of Amateur Auxiliary", ARRL-logo callsign badges with a white background and same general design as those authorized for the official family. After discussion, on motion of Mrs. Lewis, seconded by Mr. Metzger, it was VOTED that this matter be laid on the Table.

38) On motion of Mr. Frenaye, seconded by Mr. Atkins, it was VOTED that the Publications Committee study the desirability of a program where ARRL publications carry a postage-paid form which solicits feedback from the purchaser on desired changes, additions or corrections.

39) On motion of Mrs. Lewis, seconded by Mr. Frenaye, it was VOTED that the ARRL adopt a band plan for the 24 MHz band as follows: 24.890 - 24.920 CW only, 24.920 - 24.930 CW and digital, 24.930 - 24.990 CW, Phone and SSTV.

40) On motion of Mr. Stevens, seconded by Mrs. Lewis it was VOTED that the Executive Vice President study the feasibility of producing a videotape explaining packet radio equipment design for presentation to computer users and amateurs not familiar with this mode of communication.

41) It was moved by Mr. Milius, seconded by Mr. Stevens, that the ARRL QSL Bureaus, if they desire, be permitted to insert on an occasional basis, an ARRL membership application in return envelopes. After discussion, on motion of Mr. Hurlbert, seconded by Mr. Stevens, it was VOTED that the motion be amended to read as follows: "that the ARRL QSL Bureaus be urged to insert on an occasional basis as determined by guidelines to be established by the Executive Vice President, an ARRL membership application in return envelopes, and that it is the policy of the Board that the use of QSL Bureau services implies the grant of authority from the user to do so." After discussion, the motion as amended was ADOPTED.

42) It was moved by Mr. Carey, seconded by Mr. Butler, that the advisory committees be authorized funding for in-person meetings of all or part of the Committee upon specific approval from the Executive Committee or Board, which permission would be granted only in rare or unusual circumstances. After discussion, on motion of Mr. Metzger, seconded by Mr. Turnbull, it was VOTED that this matter be laid on the table. The following Directors requested to be recorded as opposed to laying the matter on the Table: Mrs. Ferdinand, Messrs. Wilson, Frenaye, Heyn, Wangler and Carey.

43) On motion of Mr. Butler, seconded by Mr. Hurlbert, it was VOTED that the Fifth ARRL Computer Networking Conference be scheduled for the weekend of March 7-9, 1986 at Orlando, Florida in conjunction with the Florida State Convention.

44) On motion of Mr. Heyn, seconded by Mr. Frenaye, it was VOTED that the Executive Vice President be directed to produce a Field Organization recruitment/education brochure to be available free of charge to League members by the end of January, 1986.

45) On motion of Mr. Wangler, seconded by Mr. Heyn, it was VOTED that the ECAC review the current limit of one hour for RACES test and drill periods to extend the time per week to allow for support communications to other emergency operations requiring more than one hour.

46) On motion of Mr. Wilson, seconded by Mr. Atkins, it was VOTED that the Board of Directors of the ARRL assembled at Hartford on 25 July 1985, does thank the Dayton Amateur Radio Association for their help and support in providing the facilities to videotape the ARRL public service announcements at the 1985 Dayton Hamvention.

47) On motion of Mrs. Ferdinand, seconded by Mr. Butler, it was VOTED that for the design and production of an initial quantity of pamphlets as proposed at Minute 54 of the 1985 Annual Meeting, and to implement that portion of the PRAC report, the sum of $10,000 is authorized, contingent upon the raising of an equivalent amount from the Amateur Radio industry.

48) It was moved by Mrs. Lewis, seconded by Mr. Frenaye, that in light of the unique role that Field Day plays in emergency communications preparedness activities, the Emergency Communications Advisory Committee and Contest Advisory Committee study the desirability of extending Field Day operation to the 24 MHz band beginning in 1986, and that a report be submitted to the Board for the January 1986 Annual Meeting. After discussion, on motion of Mr. Hurlbert, seconded by Mr. Carey, it was VOTED that this matter be laid on the Table. Mrs. Lewis and Mr. Frenaye requested to be recorded as having voted opposed to laying the matter on the Table.

49) It was moved by Mr. Milius, seconded by Mr. Frenaye, that a standard identification badge be designed and made available for purchase with space thereon providing for inclusion of the name and call sign of user, for use by all amateurs except field leadership appointees who are members of the Amateur Radio Emergency Service but not necessarily members of the ARRL. After discussion, on motion of Mr. Frenaye, seconded by Mr. Butler, it was VOTED that this matter be referred to the ECAC for study.

50) On motion of Mr. Butler, seconded Mr. Heyn, it was VOTED that an Ad Hoc committee on Amateur Radio spread-spectrum standards is established for a period of two years, with a budget of $1,500 for the remainder of 1985, and the President is authorized to appoint up to seven members, including Board and Headquarters liaisons. The assembly was in recess from 10:10 to 10:43 A.M.

51) On motion of Mr. Hurlbert, seconded by Mr. Wilson, it was VOTED that staff is encouraged to cooperate with and supply information to youth groups (such as Boy Scouts of America and Young Astronaut Council) as seems likely to develop interest in Amateur Radio among their members. Such support will recognize principles of fairness to both League members and other youth groups.

52) On motion of Mr. Wilson, seconded by Mrs. Ferdinand, it was VOTED that each member of an advisory committee is expected to submit a written report to the Director of his or her Division at least two weeks before each regular

Board meeting. This report will include a summary of all matters pending before the committee, and will also indicate the individual's recommendations as to matters expected to be before the Board in the Committee's area of concern.

53) On motion of Mrs. Ferdinand, seconded by Mr. Frenaye, it was VOTED that the Volunteer Resources Committee be directed to consider a new type of membership classification. This classification would be available to affiliated clubs and be similar to the existing associate membership in that no voting privileges would be included.

54) On motion of Mr. Frenaye, seconded by Mr. Carey, it was VOTED that the Board of Directors heartily commends the enthusiasm and effectiveness of the ARRL staff and the hundreds of volunteers who are administering the large and complex task of volunteer examining.

55) On motion of Mr. Olson, seconded by Mr. Hurlbert, it was VOTED that the motion dealing with the role Field Day plays on the 24 MHz band be lifted from the Table. At this point, Mrs. Lewis, with the consent of her second, withdrew the motion.

56) On motion of Mr. Stevens, seconded by Mr. Olson, it was VOTED that the Executive Vice President is authorized to submit to FCC a preliminary proposal for ARRL to provide assistance to the Commission in the area of call sign issuance along the lines of his report to this meeting of the Board; and further, that the Executive Committee is requested to monitor the progress of this proposal and to supply periodic reports to the Board.

57) It was moved by Mr. Milius, seconded by Mrs. Lewis, that the Volunteer Resources Committee study ways and means to protect amateurs, insurancewise, who are injured or killed while on the performance of emergency service or drilling in emergency service for ARES and ARRL. After discussion, on motion of Mr. Grauer, seconded by Mr. Metzger, it was VOTED that the matter is laid on the Table. Mr. Milius requested to be recorded as opposing the motion to lay on the Table.

58) On motion of Mr. Carey, seconded by Mr. Butler, it was VOTED that the ARRL Band Plan for the 220-225 MHz band be amended to show that repeater frequency pairs and simplex FM frequencies are allocated on 20-kHz channel spacing, rather than 40-kHz spacing, and that the plan be so shown in subsequent editions of the Repeater Directory.

59) On motion of Mr. Butler, seconded by Mr. Atkins, it was VOTED that the Executive Vice President is directed to study the costs associated with providing a system for maintaining a national repeater data base. This system should consist of: 1) an existing computer (on a time shared basis) and 2) the toll-free telephone line, now used by the publication sales department, for use by frequency coordinators between the hours of 6 P.M. and 6 A.M. Eastern time. The results of this study should be presented to the Board not later than the 1986 Annual meeting.

60) On motion of Mr. Wangler, seconded by Mr. Butler, it was VOTED that the Band Plan for the 440-450 MHz band, with specific frequency pairs recommended for repeater use in this band, be based on 25 kHz channel spacing, and that the plan be shown in subsequent issues of the Repeater Directory.

61) On motion of Mr. Metzger, seconded by Mr. Turnbull, the following resolution was ADOPTED:

> WHEREAS the Tenth Pan-American games are scheduled to be held in Indianapolis in 1987, and
>
> WHEREAS these games are intended to enhance international goodwill, an objective shared by Amateur Radio and the League and
>
> WHEREAS the ARRL Indiana Section is ready, willing and able to provide appropriate support to the Pan-American games,
>
> The Board of Directors of the ARRL does hereby commend the officials of the ARRL Indiana Section for initiating planning for this event in so timely a manner; and the Board further requests the Executive Vice President to provide appropriate and timely support for these volunteer efforts.

62) On motion of Mr. Wilson, seconded by Mr. Atkins, it was VOTED that the Board of Directors of the ARRL, assembled at Hartford on 25 July 1985, does thank: Mr. Henry Greenberg, K2SSQ, Director; Mr. William Pasternak, WA6ITF, Producer; Mr. Dave Bell, W6AQ, Producer; Mr. Richard Moseson, N2BFG, Writer; Mr. George Barker, NA1F, Cameraman; Mr. Stephen Mendelsohn, WA2DHF, Soundman; Mr. Forest Oden, N6ENV, Editor; and Mr. Jean Shepherd, K2ORS, Actor, for their professional efforts, and help, in producing the latest series of ARRL Public Service Announcements.

63) It was moved by Mrs. Ferdinand, seconded by Mr. Carey, that a quality certificate, suitable for framing, will be provided to persons passing Extra Class examinations before ARRL Volunteer Examiner Teams. The price will be fixed by the Executive Vice President at an amount which will cover all applicable costs. After discussion it was moved by Mr. Holladay, seconded by Mr. Heyn, that this matter be laid on the Table, but the motion to Table was LOST. After further discussion, on motion of Mr. Wangler, seconded by Mr. Butler, it was VOTED that this matter is postponed until after the recess for lunch. The Board was in recess for lunch from 11:52 A.M. until 1:23 P.M., reconvening with all persons hereinbefore mentioned present except Messrs. Lindholm, McCobb, and Zeigler. The Board took up the matter that had been postponed. On motion of Mr. Frenaye, seconded by Mr. Stevens, it was VOTED that the motion pertaining to certificates for Extra Class operators is amended to read as follows: "A quality certificate, suitable for framing, will be offered to persons holding the Extra Class license. The price will be fixed by the Executive Vice President at an amount which will cover all applicable costs." The question being on the motion as amended, the same was ADOPTED.

64) On motion of Mrs. Ferdinand, seconded by Mr. Wilson, it was VOTED that James Rautio, AJ3K, be awarded the 1984 "Technical Excellence Award" and awarded the Pewter Cup for his outstanding series of articles, "The Effect of Real Ground on Antennas." These articles appeared in February, April, June, August and November 1984 QST.

65) On motion of Mr. Frenaye, seconded by Mrs. Ferdinand, it was VOTED that Counsel is directed to file a request with the FCC to amend section 97.28(b) of the FCC Rules to change the phrase "one volunteer examiner" to "two volunteer examiners."

66) On motion of Mrs. Lewis, seconded by Mr. Butler, it was VOTED that the Executive Committee study the need for a revision to the FCC rules and regulations governing procedures for testing candidates in proficiency in Morse code reception, with the intent of standardizing these procedures under the Volunteer Examiner program.

67) Moved, by Mr. Stevens, seconded by Mr. Milius, that the VHF-Repeater Advisory Committee be requested to re-evaluate that portion of the 23-cm band plan pertaining to FM repeater frequency offsets, presently set at 12 MHz, in light of recent developments in the availability of commercial equipment for this band. MOVED, by Mr. Heyn that the matter be laid on the Table. But there was no second, so the motion to table was lost. The question then being on the motion, the same was ADOPTED.

68) It was moved by Mr. Milius, seconded by Mrs. Lewis, that the Membership Services Committee study the possibility of eliminating the ARRL QSO Party. After discussion, on motion of Mr. Olson, seconded by Mr. Frenaye, it was VOTED that the motion is amended to read: "Resolved, that the ARRL QSO Party be discontinued." The question thereupon being on the main motion as amended, the same was ADOPTED.

69) On motion of Mr. Butler, seconded by Mrs. Lewis, it was VOTED that the VHF Repeater Advisory Committee be requested to study the band plan for 420-450 MHz, with the intent of recommending a standard for the repeater portion. Repeater in/out frequency relationships, either high-in/low-out or low-in/high-out (to provide maximum flexibility for repeater coordinators) should be specified for each 25 kHz channel. A report from the committee should be made to the Board at the 1986 Annual Meeting.

70) It was moved by Mr. Heyn, seconded by Mr. Wangler, that the Executive Vice President is immediately to proceed with the process of determining the 1984 Instructor of the Year Award in line with the procedures described in the September 1984 issue of QST. After discussion, on motion of Mr. Olson, seconded by Mr. Hurlbert, it was VOTED that this matter be referred to the Volunteer Resources Committee.

71) On motion of Mr. Atkins, seconded by Mr. Olson, it was VOTED that the recommendations contained in the report of the Commmitee for the Strengthening of CRRL be approved as presented.

72) On motion of Mr. Metzger, seconded by Mr. Frenaye, it was VOTED that to implement the employee incentive program endorsed by the Administration and Finance Committee, the 1985 budget is amended by adding a line item of $3,000 for employee incentive awards, to be made at the discretion of the Executive Vice President.

73) It was moved by Mr. Olson, seconded by Mrs. Lewis, that By-law 6 be amended to read as follows: "6. Any member who is the eldest person eligible for full membership in the family (where family is defined as a mother, father, husband, wife and siblings) and who has not reached the age of 18 years may request a dues rate equivalent to 50% of the rate set forth in By-law 4; or, if he has not reached the age of 13 he may request a dues rate of 25% of the rate set forth in By-law 4. To be eligible to request such special rates in addition to qualifying by age the member must: a) provide a list of all the licensed amateurs that are members of the family (family as previously defined) and b) submit the membership application or renewal directly to ARRL Headquarters and not through an affiliated club. This rate shall not be available for Life Membership." After discussion, a roll call vote being required, the question was decided in the affirmative; all Directors voted in favor, except Mr. Grauer, who voted opposed, so the By-law was AMENDED. The Board was in recess at 3:01 P.M., reconvening at 3:26 P.M.

74) The Chair recognized Mr. Holladay, who reported on the progress made by the Ad-Hoc Committee appointed the previous day to draft a motion that would state the policy of the Board with regard to the FCC proposal dealing with repeater coordination, PR Docket 85-22. It was moved by Mr. Butler, seconded by Mr. Carey, that Counsel is directed to file comments with the Federal Communications Commission in PR Docket 85-22 based on the following policy guidelines:

1) Preferred status in instances of harmful repeater-to-repeater interference should be granted to amateur repeater operators who have implemented the recommendation of their local, or regional, frequency coordinator and are thereby coordinated.

2) Frequency coordination should be mandatory for all amateur stations in repeater, or auxiliary, operation in any geographical area which is served by a frequency coordinator.

3) The FCC should not consider alternatives to frequency coordination nor mandate methods of coordination.

4) The use of modern technological innovation, such as those cited in the NPRM, should be encouraged, but not substituted for frequency coordination.

5) The FCC should not recognize a single entity, such as a National Frequency Coordinator, for amateur repeater operation. Such coordination activities should be performed by local, or regional, frequency coordinators with appropriate support to these coordinators to be provided by the ARRL.

6) The ARRL also recommends that the scope of frequency coordination include all Amateur Radio stations in repeater or auxiliary operation.

7) The ARRL further recommends that consideration of the procedural framework within which frequency coordinators are recognized and conduct their operations be the subject of a future FCC proceeding.

The text of the ARRL's comments, in this proceeding, shall be reviewed by the Executive Committee prior to filing with the Commission. On motion of Mr. Wilson, seconded by Mr. Carey, it was VOTED that the motion is amended by striking the word "mandatory" in paragraph two and substituting therefor the words "strongly urged." After further discussion it was unanimously VOTED that the motion as amended is ADOPTED. Mr. Atkins abstained.

75) On motion of Mr. Hurlbert, seconded by Mrs. Lewis, it was VOTED that

WHEREAS, this Board in January 1985 charged the President, the Executive Vice President, Communications Counsel, and the Washington Area Coordinator to use their best efforts to obtain the release of the 12-meter WARC band to the Amateur Service, and

WHEREAS, those League officials exercised diligence, skill, determination and effort far beyond the normal call of duty in the successful pursuit of the objective, and

WHEREAS, on June 22, 1985, at 0001 Z, that objective became the reality of "CQ 12," now therefore,

BE IT RESOLVED that this accomplishment be recognized and rewarded by this Board, on its own behalf, and on behalf of all U.S. Amateurs as follows: "Atta Boy!"

76) On motion of Mrs. Ferdinand, seconded by Mr. Stevens, it was VOTED that the Executive Vice President be directed to formulate a program designed to integrate Amateur Radio into the curricula of the electronics and communications schools of the nation's armed services; to propose and promote implementation of such a program to appropriate representatives of the Army, Navy, Marine Corps, Air Force and Coast Guard; and to provide any assistance required in establishing such a program.

77) It was moved by Mr. Grauer, seconded by Mrs. Lewis, that the motion dealing with ARRL call sign badges for additional field appointees be lifted from the Table, but the motion was LOST.

78) It was moved by Mrs. Lewis, seconded by Mr. Milius, that the Membership Services Committee study ways and means to move the "Technical Information Service" back to Headquarters. On motion of Mr. Frenaye, seconded by Mr. Heyn, it was VOTED that the motion is amended by striking the complete text and substituting therefor the following: "that the Volunteer Resources

Committee study ways and means to strengthen the Technical Information Service." Mrs. Lewis and Mr. Milius requested to be recorded as voting opposed to the motion to amend. The question then being on the motion as amended, the same was ADOPTED.

79) On motion of Mr. Stevens, seconded by Mr. Milius, it was VOTED that the Executive Vice President investigate the feasibility of establishing and maintaining a national archive facility for Amateur Radio and report to the 1986 ARRL Annual Board Meeting.

80) It was moved by Mr. Milius that the FCC be petitioned to change the name of the Novice Class License to Amateur Entry Level License. There being no second, the motion was LOST.

81) On motion of Mr. Butler, seconded by Mr. Frenaye, it was VOTED that Counsel is instructed to file a petition for leave to amend the ARRL petition designated RM 5038 so as to maintain present power limits in the Novice bands below 28 MHz.

82) On motion of Mr. Heyn, seconded by Mr. Butler, the following resolution was ADOPTED:

WHEREAS, Senator Barry Goldwater, K7UGA, has been of invaluable assistance to the Amateur Radio Service in sponsoring legislation over many years, to provide for the enhancement of international goodwill through the reciprocal licensing of aliens; to authorize the establishment of minimum performance standards for home electronic equipment; to establish and provide for the reimbursement of expenses of the Volunteer Examination Program; to improve rule compliance via the Volunteer Monitoring Program; and to defend the right of amateurs to erect reliable, effective antennas; and

WHEREAS, this assistance has been provided through the selfless dedication of Senator Goldwater to the Amateur Radio Service;

NOW, THEREFORE BE IT RESOLVED that the League present Senator Goldwater with a plaque to be presented at the Southwestern Division Convention on August 10, 1985, to express the gratitude of the League, its members, and all amateurs for the unique contributions of this gentleman.

83) On motion of Mr. Milius, seconded by Mr. Butler, it was VOTED that the ARRL Board of Directors in meeting assembled extends its appreciation to sincerely thank all those individuals who have devoted and continue to devote their time and energy working in the QSL Bureaus.

84) There followed an opportunity for all present to make final comments. There being no further business the Board adjourned sine die at 5:36 p.m. Total time in session as a Board: 14 hours 14 minutes; direct authorizations: $14,500.

Respectfully submitted,

Perry Williams

Perry Williams, W1UED
Secretary

FAXED 2/15

Before the
Federal Communications Commission
Washington, D.C. 20554

PR
FCC 85-460
36092

In the Matter of	)	
	)	
Amendment of Parts 2 and 97 of	)	PR Docket No. 84-960
the Commission's Rules to	)	
Implement allocation of	)	RM-4781
additional frequencies for the	)	RM-4784
Amateur Radio Service, the Radio	)	
Amateur Civil Emergency Service	)	
and the Amateur-Satellite Service.	)	

Second Report and Order

Adopted: August 9, 1985 ; Released: August 15, 1985

By the Commission:

1. In the Notice of Proposed Rule Making, 49 FR 40611, October 17, 1984, in this proceeding, we proposed to implement certain frequency band allocations to the Amateur Radio Service pursuant to our Second Report and Order in General Docket No. 80-739, 49 FR 2357, January 19, 1984. Specifically, we proposed: (1) to add the 10.100-10.150 MHz frequency band to the Amateur Radio Service and to the Radio Amateur Civil Emergency Service; (2) to add the 24.890-24.990 MHz frequency band to the Amateur Radio Service and to the Amateur-Satellite Service; and (3) to add the frequency band 902-928 MHz to the Amateur Radio Service. We also proposed to remove the 420-430 MHz band from the Amateur Radio Service north of Line A. (Line A is defined in Section 97.185(c)(5) of the Commission's rules).

2. The proposals relating to the twelve and thirty meter bands were addressed in this proceeding's First Report and Order, 50 FR 18662, May 2, 1985.[1] This document addresses the remaining issues.

3. 420-430 MHz. We proposed to remove this spectrum from the Part 97 Amateur Radio Service north of Line A to implement action we had already taken in General Docket No. 80-739. In that proceeding we amended the Part 2 Table of Allocations (47 CFR §2.106) to add a

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1 The frequencies between 10.100 and 10.150 MHz are commonly referred to in the amateur community as the thirty meter band. The frequencies between 24.890 Mhz and 24.990 MHz are commonly referred to in the amateur community as the twelve meter band.

new footnote (NG 135) to indicate that the amateur service is not allocated north of Line A. We took this action pursuant to the Arrangement between the Department of Communications of Canada and the National Telecommunications and Information Administration and the Federal Communications Commission of the United States concerning the use of the 406.1 MHz to 430 MHz band in Canada-United States border areas effected by exchange of notes at Washington, D.C., February 26 and April 7, 1982, and entered into force April 7, 1982. We also proposed, consistent with paragraph 32 of the Second Report and Order in General Docket No. 80-739, supra, to grant amateur radio operators waivers on a case-by-case basis to operate in this band, subject to successful prior coordination by the FCC with the Canadian administration.

4. The Northern Illinois DX Association, Bruce O. Jordan and Joseph J. Schweda, Jr., filed comments objecting to the proposed removal of this band from the amateur service north of Line A. However, the relative merits of this action are not at issue. We are required to honor the terms and conditions of the Arrangement which specifically states at paragraph 2.2: "The Amateur Service is excluded from the band 420-430 MHz in the Coordination Zone ..." In the U.S., that zone is the area north of Line A.

5. The Southern California Repeater and Remote Base Association (SCRRBA) argued that the proposed rules language for this band was confusing. SCRRBA claimed that from the proposed language one could not determine whether the spectrum was withdrawn from the amateur service or merely available subject to conditions. SCRRBA recommended alternative language reflecting the latter interpretation. However, the former interpretation is correct. Any rules authorizing amateur operation north of Line A in this band would be in derogation of the Arrangement. Therefore, we are adopting rules which prohibit any amateur operation in this band north of Line A. Waiver of these rules would require successful prior coordination with Canada.

6. Both the American Radio Relay League, Incorporated (ARRL), and SCRRBA requested more specificity about the standards for grant of a waiver in this band and the technical and other showings which must be made for such a waiver. Any application for waiver of the rules to operate in the 420-430 MHz band north of Line A would, of course, need to make a technical showing that the operation would cause no harmful interference to Canadian radio operations. Any such application in all other respects would be required to meet the standard threshhold tests for grant of a waiver. Since the waiver process is "a safety valve procedure for consideration of an application for exemption based on special circumstances," WAIT Radio v. FCC., 418 F.2d 1153, 1157 (D.C. Cir. 1969), it is not possible to predict in advance what "special circumstances" might arise warranting

waiver of the new rule in any particular matter or individualized situation. In any event, we have already specified that grant of such a waiver would be subject to successful prior coordination with the Canadian administration.

7. To date, we have not been able to arrange prior coordination of formal waiver requests to operate north of Line A at 420-430 MHz with the Canadian administration. However, through informal notification procedures we may be able to arrange certain FCC-licensed amateur operation on a secondary non-interference basis at the sufferance of the Canadian administration on a case-by-case basis. Specific requests to make such an arrangement should be directed to the Private Radio Bureau Licensing Division in Gettysburg, Pennsylvania.

8. 902-928 MHz. We also proposed to implement allocation of the 902-928 MHz frequency band to the Amateur Radio Service in all of the United States and its possessions except for Colorado, Wyoming and U.S. possessions in Region 3.[2] [3] We proposed to make amateur operation in this band secondary to operation of Government stations, Automatic Vehicle Monitoring (AVM) systems, and industrial, scientific and medical (ISM) devices.[4] Additionally, the proposal required FCC-licensed amateurs to avoid harmful interference to authorized fixed, mobile and broadcasting operations in Regions 1 and 3. We proposed to make this band available for the use of all amateur operators above Novice class, and to allow a wide range of emission types in the band.

9. The ARRL, SCRRBA, Sherwood Libit, Robert J. Roehrig, and Joseph J. Schroeder, Jr., commented in favor of the 902-928

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2 Footnote US 267 to the Table of Allocations (47 CFR §2.106) prohibits amateur radio station operation in the 902-928 MHz band in Colorado or Wyoming.

3 The 902-928 MHz band is not allocated for the amateur service outside of Region 2 in the International Table of Allocations.

4 See footnotes US 218 and US 275 to the Table of Allocations (47 CFR §2.106).

MHz proposal.[5] The Personal Radio Steering Group, Inc., (PRSG), Sensormatic Electronics Corporation (Sensormatic), Suncom, Inc. (Suncom), X-cyte Inc. (XCI), Ray Newhall, and Michael C. Trahos commented against the proposal.[6] PRSG, Newhall, and Trahos cite our recent decisions to decline to adopt a Private Radio Communications Service (PRCS) and to dismiss a Petition for Rule Making by MURA Corporation to create a new 900 MHz personal communication service. Report and Order, In the Matter of Creation of an Additional Private Radio Service, General Docket No. 83-26, 50 FR 865, January 7, 1985. They contend that because these proposals were rejected primarily due to an inadequate amount of spectrum in the land mobile reserve, the amateur service should be required to make a showing of need for the 902-928 MHz frequency band. They urge us to consider whether this spectrum is more suitable for a personal communication service. Sensormatic and Suncom also commented that there is an insufficient showing of need for this spectrum for the Amateur Radio Service.

10. We initiated this proceeding to implement certain spectrum allocation decisions we made regarding the Amateur Radio Service in the Second Report and Order in General Docket No. 80-739, In the Matter of Amendment of Part 2 of the Commission's Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979, 49 FR 2357, January 19, 1984. The amateur community faces no additional burden of proof to retain the 902-928 MHz domestic secondary allocation we made at that time.

11. Moreover, we addressed the issue of whether a domestic mobile allocation should be made in the 902-928 MHz band and concluded that the

---

5 The Society for the Promotion of Amplitude Modulation, Larry E. Jones, Bruce O. Jordan, Jan A. Tarsala, and Joseph Anthony Wolos also generally favored all of the proposals to implement allocation of additional frequencies to the Amateur Radio Service.

6 The comments of Sensormatic were filed on May 7, 1985. The Comments of XCI were filed on May 16, 1985. While these comments are both late-filed, they provide relevant information about Part 15 devices in the 902-928 MHz band submitted by principals with a direct interest in these devices. We therefore find it is in the public interest to accept these comments and to include them as part of the record. 47 U.S.C. §154(j).

record did not justify such an allocation. See Second Report and Order, General Docket No. 80-739, supra at para. 45. While we indicated we would consider appropriate action if an adequate showing was made in the future, the record before us does not make a prima facie case for a personal communications service in this band. It appears that a secondary personal communications service could receive considerable harmful interference from and cause harmful interference to current primary government military radiolocation uses.[7] We therefore decline to consider a personal radio service allocation in the 902-928 MHz band in this proceeding.

12. In two other ongoing proceedings (General Docket Nos. 84-1231 and 84-1233) we have solicited comments on the feasibility of geographically sharing proposed spectrum allocations for private land mobile and cellular services to implement a personal communications service outside major population centers. Additionally, Petitions for Reconsideration of our action in the Report and Order in General Docket No. 83-26, supra, are still pending. We do not by our action in this proceeding intend to prejudge those dockets.

13. Sensormatic, Suncom and XCI also opposed inclusion of the 902-928 MHz band in the Amateur Radio Service on the basis that it may cause destructive interference to field disturbance sensors. Part 15 field disturbance sensors may be operated in the entire 902-928 MHz band (at a nominal operating frequency of 915 ± 13 MHz). However, pursuant to 47 CFR §15.311, operation of field disturbance sensors is subject to the general conditions of operation in 47 CFR §15.3. These conditions include a specific statement that there is no vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment. Additionally, Part 15 devices like field disturbance sensors are secondary to all other operations -- they must cause no harmful interference to other operations and must suffer interference from them. Thus, the fact that they may suffer such interference as a result of this action is not a compelling argument against the proposal.[8]

---

7 See Order, FCC 85-444, August 5, 1985.

8 Sensormatic implies in its Comments, at page 3, that amateur secondary usage and Part 15 field disturbance sensor usage would be of equal status. This is not the case. Part 15 devices, including field disturbance sensors, must tolerate interference from operation in any radio service, whether it is listed as primary or secondary in the Table of Allocations.

14. Joseph Schroeder recommended that rather than prohibiting all amateur operations in this band in Colorado and Wyoming, we need only require amateurs to operate with reduced power. The treatment of the Colorado-Wyoming areas is pursuant to footnote US 267 in the Table of Allocations (47 CFR §2.106). We concluded that this footnote was necessary to protect existing Government operations in these areas. See Notice of Proposed Rule Making, General Docket No. 80-739, 48 FR 3790, January 27, 1983, at para. 74. However, we also noted that reaccommodation of these operations was under study and if accomplished, US 267 may be deleted. Id. We expect that reaccommodation of these services will be accomplished within a year. If it is, US 267 will then be deleted. Until such time, the prohibition of amateur operation in the 902-928 MHz band in Colorado and Wyoming must remain to protect Government operations.

15. SCRRBA suggested addition of frequency modulated composite emissions in the 902-928 MHz band to permit suitably equipped amateur stations to transmit communications consisting of multiplexed channels. We agree with SCRRBA that such emissions would serve the dual purpose of permitting amateur operators to experiment with a new transmission mode and to efficiently utilize the spectrum when several different channels of information must be transmitted simultaneously from one location to another. We are therefore including this type of emission in our final rules for the 902-928 MHz band.

16. Jan Tarsala urged us to authorize a maximum of 1500 watts peak envelope power for amateur stations in repeater operation in this band, and to permit wideband digital transmissions. We agree that the initially sparse occupancy of this band recommends it as excellent spectrum for experimentation with wideband modulation formats, and that a greater authorized maximum power for repeater operation would enhance amateur communication in this band by overcoming propagation losses. We are therefore including both changes in the final rules.

17. Miscellaneous. The rules we are adopting conform to the new frequency and emission tables we recently adopted to achieve more usable formats, see Order, 50 FR 13792, April 8, 1985, and to the new emission designators we adopted in the Third Report and Order in General Docket No. 80-739, 49 FR 48964, December 14, 1984. We are also correcting a typographical error in the First Report and Order in this proceeding, 50 FR 18662, May 2, 1985, in footnote 1 to 47 CFR §97.415.

18. This action has been analyzed with respect to the Paperwork information collection and/or record keeping, labeling, disclosure, or record retention requirements; and will not increase or decrease burden hours imposed on the public.

19. The Commission has certified in accordance with Section 605 of the Regulatory Flexibility Act that these rules do not have a significant economic impact on a substantial number of small entities, because these entities may not use the Amateur Radio Service for commercial radiocommunication (see 47 CFR §97.3(b)).

20. In view of the foregoing, IT IS ORDERED, That Parts 2 and 97 are amended as set forth in the attached Appendix. This action is taken pursuant to the authority contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended (47 U.S.C. §§154(i) and 303(r)).

21. IT IS FURTHER ORDERED, That these rule amendments are effective 0001 UTC, September 28, 1985.

22. IT IS FURTHER ORDERED, That this proceeding IS TERMINATED.

23. For information concerning this proceeding contact John J. Borkowski, Federal Communications Commission, Private Radio Bureau, Washington, D.C. 20554 (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

Attachment: Appendix

Appendix

Parts 2 and 97 of Chapter I of Title 47 of the Code of Federal Regulations are amended as follows:

1. The authority citation for Part 2 continues to read as follows:

   Authority: Sec. 4, 303, 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154,303, unless otherwise noted.

2. The second sentence is removed from footnote NG 135 to the Table of Frequency Allocations in Section 2.106.

3. The authority citation for Part 97 continues to read as follows:

   Authority: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303, unless otherwise noted. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-155, 301-609.

4. Paragraph (l) of Section 97.3 is revised to read:

§97.3 Definitions.

*　　*　　*　　*　　*

(l) Line A.

Line A begins at Aberdeen, Washington, running by great circle arc to the intersection of 48° N., 120° W., thence along parallel 48° N., to the intersection of 95° W., thence by great circle arc through the southernmost point of Duluth, Minn., thence by great circle arc to 45° N., 85° W., thence southward along meridian 85° W., to its intersection with parallel 41° N., thence along parallel 41° N., to its intersection with meridian 82° W., thence by great circle arc through the southernmost point of Bangor, Maine, thence by great circle arc through the southernmost point of Searsport, Maine, at which point it terminates.

*　　*　　*　　*　　*

5. In Section 97.7, the Megahertz entries for the Technician, General, Advanced and Amateur Extra classes in paragraph (a) are amended by adding limitation 11 to each of the 0.70 meter entries and by adding a new 0.35 meter entry between each of the 0.70 and 0.23 meter entries, and in paragraph (b) limitations (11) and (12)

are added to read as follows:

§97.7 Control operator frequency privileges.

* * * * *

Control operator license class	Meter band	Terrestrial location of the amateur radio station ITU Region 1	ITU Region 2	ITU Region 3	Limitations (See para. (b))
*		*	*	*	*
Technician			Megahertz		
*		*	*	*	*
	0.70	430-440	420-450	420-450	3,4,11
	0.35	-------	902-928	-------	1,3,12
*		*	*	*	*
General			Megahertz		
*		*	*	*	*
	0.70	430-440	420-450	420-450	3,4,11
	0.35	-------	902-928	-------	1,3,12
*		*	*	*	*
Advanced			Megahertz		
*		*	*	*	*
	0.70	430-440	420-450	420-450	3,4,11
	0.35	-------	902-928	-------	1,3,12
*		*	*	*	*
Amateur Extra			Megahertz		
*		*	*	*	*
	0.70	430-440	420-450	420-450	3,4,11
	0.35	-------	902-928	-------	1,3,12

* * * * *

(b) Limitations:

* * * * *

(11) No station shall operate north of Line A (see §97.3(l)) in the 420-430 MHz band.

(12) In the 902-928 MHz band, amateur radio stations shall not operate within the States of Colorado and Wyoming, bounded by the area of: latitude 39° to 42° N, and longitude 103° W to 108° W. The band is allocated on a secondary basis to the amateur service subject to not causing harmful interference to the operations of Government stations authorized in this band or to Automatic Vehicle Monitoring (AVM) systems. Stations in the amateur service must tolerate any interference from the operations of industrial, scientific and medical (ISM) devices, AVM systems and the operations of Government stations authorized in this band.

6. Paragraph (a) of Section 97.61 is amended by adding an entry to the Table therein under Megahertz, between the 420-450 MHz and 1215-1300 MHz entries, to read as follows:

§97.61 Authorized emissions.

* * * * *

Frequency band	Emissions	Limitations (see paragraph (b))
* *	*	* *
<u>Megahertz</u>		
* *	*	* *
902-928	N0N, A1A, A2A, A2B, A3E, A3C, A3F, F1B, F2B, F3E, G3E, F3C, F3F, F8E, P0N	
* *	*	* *

7. Paragraph (c) of Section 97.67 is amended by revising the heading of the third column of the Table therein to read "902 MHz" instead of "1215 MHz," as follows:

§97.67 Maximum authorized transmitting power.

* * * * *

Antenna height above average terrain in meters	Maximum effective radiated power for frequency bands above 29.5 MHz	40 Mhz	902 MHz

* * * * *

8. Paragraphs (c)(2)(ii) and (c)(2)(iii) of Section 97.69 are revised to read:

§97.69 Digital communications.

* * * * *

(ii) 100 kHz on frequencies between 220 and 902 MHz.

(iii) On frequencies above 902 MHz any bandwidth may be used provided that the emission is in accordance with §97.63(b) and §97.73(c).

9. Subparagraph (5) of paragraph (c) of Section 97.185 is revised to read:

§97.185 Frequencies available.

* * * * *

(5) No station shall operate north of Line A (see §97.3(i)) in the 420-430 MHz band.

* * * * *

10. Footnote 1 to Section 97.415 is revised to read:

§97.415 Frequencies available.

* * * * *

1 Unless otherwise specified in this Subpart the rules regarding authorized emission modes (§§97.61 and 97.65) and authorized transmitting power (§97.67) are applicable for each of the listed frequency bands.

~~DS~~ PR

THE AMERICAN RADIO RELAY LEAGUE, INC.

INTERNATIONAL SECRETARIAT OF THE INTERNATIONAL AMATEUR RADIO UNION

ADMINISTRATIVE HEADQUARTERS NEWINGTON, CONNECTICUT, U S A 06111

A.R.R.L. HQ

1985 AUG -6 AM 10: 56

OFFICE OF LEGAL COUNSEL
1920 "N" STREET, N.W., SUITE 520
WASHINGTON, D.C. 20036
(202) 296-9100

August 2, 1985

Mr. David Sumner, K1ZZ,
Executive Vice President
ARRL Headquarters
225 Main Street
Newington, CT 06111

Dear Dave:

Attached herewith is a photocopy of the filing receipt for trademark applications which we received recently in the mail. The "AX.25" service mark application has been given File No. 73/544208 by the Patent and Trademark Office. Apparently their backlogs are improving in that they now suggest that no correspondence on this application should be expected before approximately five months from filing. I believe the application is presently in order and that nothing need be done except to wait for the confirmation of the grant of the service mark. I would appreciate it if you would mention to Paul Rinaldo the status of the application.

With kindest personal regards,

Yours very truly,

Chris

Christopher D. Imlay, N3AKD

CDI:fjm
Enclosure

RECEIVED JUL 30 1985

FORM PTO-100
(REV. 8-78)
US DEPT OF
COMM-PAT &
TM OFFICE

FILING RECEIPT FOR TRADEMARK APPLICATIONS (see reverse)

No correspondence on this application should be expected before approx. 5 months from filing.

CLASS	FILING DATE	SERIAL NO.
9	06/21/1985	73/544203

APPLICANT
AMERICAN RADIO RELAY LEAGUE, INCORPORATED, THE

MARK
AX.25

ADDRESS
CHRISTOPHER D. IMLAY
BOOTH, FRERET & IMLAY
SUITE 520
1920 N STREET, N. W.
WASHINGTON, D.C. 20036

ORIGINAL

10701 Five Forks Road
Frederick MD 21701

301-293-2448 home
703-689-6556 work
telex: 257537 eric ur

1985 August 6

ARRL Ad Hoc Digital Committee
c/o Paul Rinaldo
225 Main Street
Newington CT 06111

Dear gentlemen,

This letter sets out some thoughts about address translation. These thoughts are independent of network protocol choice.

BACKGROUND:

1. We have not agreed on how to route information in an amateur packet network.

2. The agreed network principles state that the network should be easy to use. The priniciples also state that the cost of the end-user equipment should be minimized.

3. The end-user will not necessarily know the route that information must take to reach its destination(s).

4. It is inconvenient for the end-user to identify the geographical location of the destination(s). Furthermore, that geographical destination may change; e.g., when someone moves their station or goes on vacation.

5. Knowledge of the geographical location of the destination still does not identify how the information should be routed. A given geographical area may be served by more that one packet switch.

6. To route information successfully, we must know to which packet switch the destination is listening.

7. Similar to (4) above, it is inconvenient for the originating

end-user to know the identity of the packet-switch serving the destination.

8. The most convenient information known about the destination is the callsign-substation ID.

9. Existing packet users are accustomed to specifying destinations by callsign-subsstation ID.

ISSUE:

How shall information be routed from its source to its destination(s)?

RECOMMENDATION:

1. The originator shall specify the destination(s) by its/their callsign-substation ID(s).

2. The packet-switch serving the originator shall determine the callsign-substation ID of the packet-switch to which a destination is listening.

3. Routing of the information through the network shall be done on the basis of the callsign-substation ID of the destination-serving packet-switch.

Example: K1ABC-1 is served by a packet-switch W1AAA-1. K6XYZ-1 is served by a packet-switch W6ZZZ-1. When K1ABC-1 wants to send information to K6XYZ-1, he specifies "K6XYZ-1" as the destination. His serving switch W1AAA-1 determines that K6XYZ-1 is served at the moment by W6ZZZ-1. W1AAA-1 then routes the information to W6ZZZ-1 by any available route; each intermediate switch also routes on the basis of W6ZZZ-1.

CONSEQUENCES:

1. Packet-switches which serve users must have a database. The database lists all stations which can be reached through the network that includes that packet-switch, and the serving packet-switch for each station.

2. When a station first starts monitoring a packet-switch's local access frequency, it should register with the switch. The switch then transmits the necessary information throughout the network to indicate that "K3NA-1 is now served by W3AAA-2".

3. It is assumed that a particular callsign-substation ID will monitor only one packet-switch. If the same callsign-substation ID monitors two switches simultaneously, the most recently updated information would prevail in the network. That is, databases will be designed to hold only one entry of serving switch per call-substation ID.

4. When a callsign-substation ID goes off the air, it is desirable to unregister first (when feasible) with the serving switch. A new database update would then be transmitted. An appropriate message may be left behind for a requested time; e.g., "on vacation until (date)."

5. Of course, sudden departures can not be prevented. No database update would occur. But when an attempt was made to deliver information, and the serving switch discovers that it can not establish a link-layer connection to that callsign/substation ID, the database can be annotated with the equivalent of "not able to connect since date/time". Periodic attempts could be made over a subsequent time interval to connect to stations so annotated. After a predetermined interval has expired with no further contact, these stations may be deleted from the database entirely. Suitable database updates would be propagated through the network during this process.

6. When a new switch joins the network, its presence becomes known to all other switches. See a subsequent letter on route selection. As each other switch becomes aware of the newcomer, it transmits to the newcomer a list of locally-served callsigns-substation IDs. Thus, the newcomer gradually fills in its database.

7. When a switch updates its list of locally-served callsigns-substation IDs, it transmits a database update to all other known switches. A single transmission is made to groups of switches for efficiency; this will become clear when route selection is explored further. To minimize interference with user traffic, these updates can be transmitted at a lower priority than user traffic.

8. To estimate database size, we assume that each entry contains 7 bytes of destination user callsign-substation ID, 7 bytes of serving switch callsign-substation ID, plus an associated 2 byte pointer in some ordered list to allow quick searching (e.g., binary chop). The total for one entry is 16 bytes. If 25% of the US ham population become packet network users, and the network is fully interconnected (no islands), about 100,000 entries will be needed at each switch which performs an end-user function. (That is, switches which ONLY serve to TRANSIT traffic, and have no local users, will have no database.) A 1.6 Mbyte database is feasible to include in a packet-switch by the time 100,000 hams become connected to the network, if not today.

CONCLUSION:

The above outlines a target for performing the "address translation" function of a network; i.e., translating from user-provided information about the destination to something the network can route on. Subsequent letters are planned on:

-- route selection.

-- a proposed alternative electronic mail service (free!) for the committee.

-- more details on the Q.931 protocol.

Eric

Eric L. Scace, K3NA

N16A
THE AMERICAN RADIO RELAY LEAGUE, INC. • SECTION TRAFFIC MANAGER
LEADERSHIP OFFICIAL
Section Traffic Manager: East Bay

DONALD SIMON
2327 Alva Avenue
El Cerrito, CA 94530
415-237-1381

QST OFFICIAL JOURNAL

Aug 15

Hi HANK —

Thought you might be interested IN this STUFF — CARL STEVENSON is WA6VSE ON 145.01 VIA AMT, AMT-1, AMT-2, AMT-3 —

73

DON

Narrowband DPMM Modulation Is 'Backward Compatible' With FM

By Carl R. Stevenson
Consulting Engineer

Digitally processed multi-mode modulation (DPMM) matches ACSB spectrum efficiency in narrowband mode. Same hardware can transmit and receive conventional FM, offering backward compatibility with existing systems.

As most **MRT** readers probably are aware, the FCC has released a Notice of Proposed Rulemaking (NPRM), Docket No. 84-279, which puts forth a proposed regulatory structure for, and solicits comments on, the "normalization" of licensing for narrowband systems including, but not limited to, ACSB in the 150 MHz band.

The prospect of new technologies which would allow more users per megahertz and alleviate congestion in the land mobile bands certainly is appealing, but a number of issues require serious consideration: "Which technology or combination of technologies?" "What's available right now?" "In the short term?" "In the long term?" "How will these technologies be *practically* introduced into the already crowded land mobile bands?" "Are they compatible with present systems?" "With each other?"

Good News, Part 1

There are several technologies which appear feasible for use in "narrowband" voice transmission systems. Those which have received the most attention and public scrutiny to date are:

ACSB, amplitude compandored single sideband.

Digital voice transmission systems, using linear predictive coding (LPC) or other low bit rate (≈2400 bps) vocoding techniques.

Narrowband FM, using reduced deviation and narrower IFs.

Of these technologies, ACSB has shown the greatest promise, at least for the foreseeable future, in terms of voice quality vs. bandwidth occupied. Digital (vocoder) techniques cannot presently deliver commercially acceptable voice quality using bit transmission rates which are feasible for 5.0 kHz channel spacing (≈2400 bps), and reducing the bandwidth of FM transmissions simply by turning down the deviation and using narrower IF filters reaches a threshold of practicality at about 12.5 kHz channel spacing. ACSB, however, has a demonstrated capability to offer excellent voice quality with 5.0 kHz channel spacing, *at least in the 150 MHz band.*

The Bad News

Unfortunately, as the saying goes, "There's no such thing as a free lunch!" ACSB, *as embodied in currently available equipment*, offers certain advantages over FM, *but* (at least in its present form) *it also presents its own unique set of design and implementation problems*, due to the basic nature of the traditional single sideband modulation and demod-

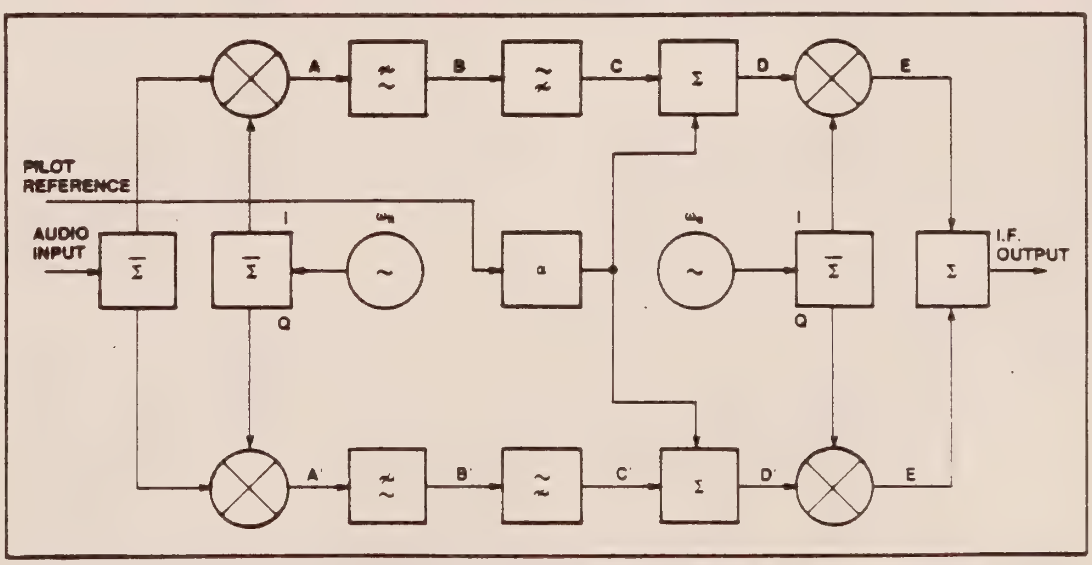

Fig. 1—DPMM modulator in digitally processed single sideband mode is diagrammed in simplified analog implementation. New mode is based upon 'Weaver modulator' proposed but found impractical in 1956. State-of-the-art component technology now makes it feasible.

ulation techniques being utilized and the multipath fading characteristics inherent in the mobile environment at VHF and UHF frequencies.

Three primary problems associated with the use of current generation ACSB in the VHF and UHF regions must be addressed:

(1) Automatic frequency control (AFC) to deal with the frequency stability tuning accuracy problems and assure the proper demodulation of ACSB signals,

(2) Automatic gain control (AGC) to deal with the rapid fading inherent in the mobile environment and prevent it from rendering the received signals unreadable, and

(3) Implementation problems relating to how to introduce ACSB into bands which already are occupied to virtual saturation by FM systems in many areas (the presently available ACSB systems offer no compatibility or interoperability with FM).

Readers of *MRT* should be familiar with the frequency control and fading correction problems that necessitate the use of "pilot" with the ACSB signal. At this point it is sufficient to state that the performance of the "tone-above-band" marketplace becomes questionable at frequencies much above the 150 to 175 MHz band.

Incompatibility

One of the *most* significant disadvantages of the techniques utilized in currently available ACSB equipment is that *they offer no compatibility whatsoever with the FM technology in use in virtually all of the present day conventional, trunked, and cellular systems.* This presents *distinct* economic and implementation problems for the majority of current mobile communications users—particularly those with large fleets of radio equipped vehicles.

Public safety agencies (who desperately need additional channel capacity) represent a perfect example of how potential users can be precluded, practically and economically, from taking advantage of a narrowband technology such as ACSB by this lack of compatibility. All of their units absolutely must be able to intercommunicate for safety reasons. While they almost certainly would like to be able to take advantage of the additional channel capacity that ACSB and "channel splitting" could provide, they can't afford (who can?) to scrap an entire fleet of existing and serviceable FM units in order to make an overnight conversion to a more spectrally efficient technology. Their operational needs also strongly tend to preclude having two or more kinds of incompatible radios or subsystems.

Because of these factors, it seems that for a narrowband technology to gain really widespread acceptance and application (and eventually replace FM entirely) it must provide acceptable perfomance in *all* of the land mobile bands (not just in the 150 MHz band). It would also ideally offer (at no additional cost) "backward compatibility" and interoperability with existing FM equipment. This combination would allow the implementation of a sensible phase-in plan which would fit both the operational needs and financial limitations of the users.

The results of detailed studies con-

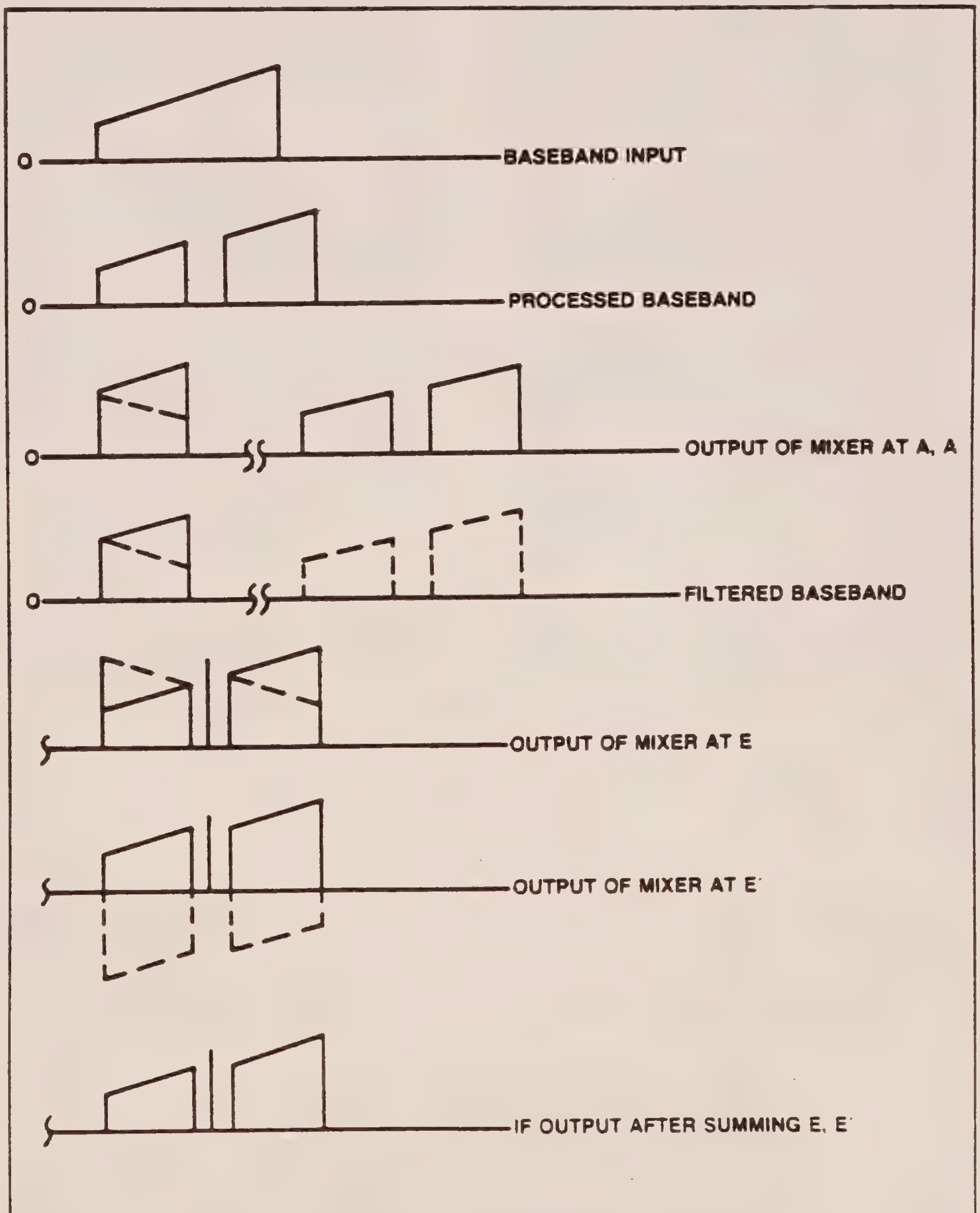

Fig. 2—Illustration of digitally processed single sideband (DPSB) spectra at key points in DPMM transmitter, referenced to Fig. 1. Symmetrically superimposed 'mirror image' sidebands suppress adjacent channel splatter.

ducted by this author under the auspices of NASA's MSAT program (a land mobile satellite system technology development program, managed by Caltech at the Jet Propulsion Laboratory) strongly supported the conclusion that virtually all of the major disadvantages of previously investigated ACSB methods seemed to be rooted in the utilization of traditional SSB modulation and demodulation techniques and the resulting treatment of the fading correction circuitry as merely "an add-on convenience circuit."

It was decided that a departure from traditional SSB modulation and demodulation methods, coupled with a considerably more intimate association between the demodulation and fading correction processes, might yield positive results.

This premise was the cornerstone of a subsequent design effort, aimed at the creation of a new and improved method of addressing the problems of ACSB in the higher-frequency bands. The goals and results of that effort will be described in the following sections.

The primary design goals were to:

- Achieve acceptable performance, despite severe channel impairments inherent at higher frequencies in the mobile environment, permitting one technique to be used "across the board" throughout the land mobile bands;
- Develop techniques which make use of available and inexpensive integrated circuits to the maximum extent possible and/or lend themselves to integrated circuit implementation, thereby reducing both the size and cost of ACSB radios;
- Achieve the maximum possible degree of compatibility and circuit commonality with existing FM systems, to ease the introduction of the technology into already crowded land mobile bands;
- Achieve the maximum possible degree of compatibility and circuit commonality with efficient, narrowband digital modulation techniques; and
- Eliminate, wherever possible, the requirement for bulky and/or expensive parts, tuning adjustments, and reliance on tight component tolerances for long-term performance stability.

The Good News, Part 2

The result of this design effort is a new technology dubbed "digitally processed multi-mode modulation" (DPMM). It is a modulation and demodulation system which uses digital signal processing (DSP) techniques to provide an advanced form of ACSB (DPSB), complete backward compatibility and interoperability with FM (DPFM), and the capability of transmitting digital data in either the DPSB or DPFM modes—all with the same compact, cost-effective hardware!

Because of DPMM's extensive use of readily available, off-the-shelf, very large scale digital integrated circuits (VLSIs), DPMM radios will be economical to produce, reliable, and, despite their comparative complexity, very easy to service.

"Digital signal processing" may sound ominous, but the vast majority of the complexity will be "buried" in a very small handful of digital VLSIs where the service technician won't have to deal with it. There will be very few tuning adjustments in DPMM radios, and most repairs will be effected by simple replacement of one of the ICs. That's the beauty of digital circuitry!

The significance of DPMM may not be immediately apparent, but its advantages include:

- The ease with which DPMM can be phased into bands and systems where traditional FM equipment is in use,
- The utility of a radio which can communicate in the DPSB mode via a land mobile satellite system when the user is in remote areas (for bandwidth and power efficiency through the spacecraft), but become an FM cellular mobile telephone when the user returns to a more densely populated area where cellular service is available, and
- The probability that, in time, the cellular service itself could be very gracefully converted to the use of the DPSB mode through the gradual introduction of DPMM radios. The initial operation would be FM, with a phased conversion as more and more DPMM radios were placed into service. The eventual result would be much higher capacity in the same allocation, due to the availability of approximately six times more channels than the present FM system provides.

While the vast majority of DPMM signal processing is actually being implemented in a digital form, the basic principles of operation can most easily and briefly be described in terms of its conceptual parent—a functionally equivalent analog implementation. The reader is cautioned to remain aware that there will not necessarily be a direct "functional block" to "functional block" correspondence between the digital implementation and this analog equivalent thereof. In fact, a simple analog form may not be realizable at all, due to the fact that digital signal processing sometimes allows the designer to draw upon a

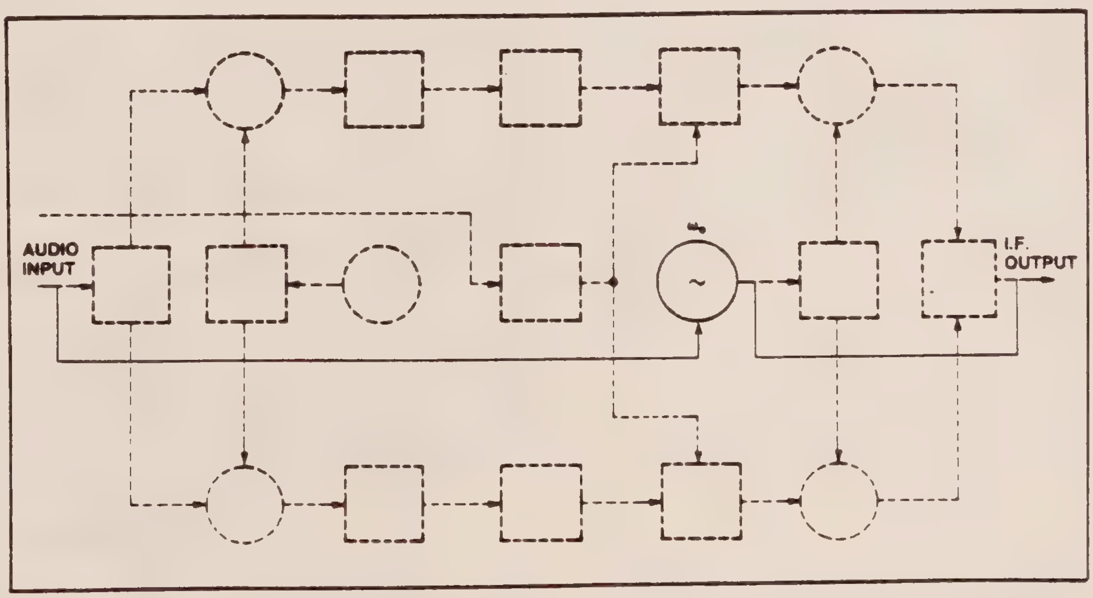

Fig. 3—Solid line shows only minor changes are needed to convert DPMM transmitter from DPSB to 'backward compatible' DPFM mode because ω is a carrier at the center of the channel. Audio signal frequency modulates ω; IF upconverts signal to ouput frequency.

"bag of tricks" which have no directly, conveniently realizable counterparts in the analog world (due to the limitations of analog components).

The conceptual basis for the SSB modulation and demodulation is the Weaver modulator. While this method of generating and detecting SSB signals first was described in the literature in 1956, to date it has not seen significant use in practical applications. At the time this method first was proposed, the state-of-the-art in component technology made it impractical, due to its requirements for the generation of very accurate quadrature phase shifts at both RF and AF frequencies and close gain, phase, and delay matching between its two signal channels. Recent improvements in component technology largely have removed these barriers, making it a practical and economical alternative to more conventional SSB methods.

Correction for random amplitude and phase modulations due to multipath fading is provided by incorporating an amplitude-normalized sine-cosine demodulator into the Weaver demodulator, as described below.

The SSB generator is the basic Weaver modulator, modified to include highpass filtering and carrier insertion. For the sake of simplicity, some of the basic audio processing circuitry and the final transmitter stages have been omitted from Fig. 1, since they are comparatively straightforward. It is assumed that the audio input will be band-limited, compressed, preemphasized and processed in a fashion similar to that described for the "TTIB" method by McGeehan et al, so that the audio baseband exhibits a mid-band spectral gap of twice the expected Doppler frequency, plus some allowance for imperfect filtering.

Referring to Fig. 1, the processed audio input signal is split into two inphase components of equal magnitude and applied to the first set of mixers, where they are mixed with two quadrature-phase components of ω_k, which is an audio frequency "sub-carrier" with a frequency equivalent to the center of the processed baseband signal.

The resulting outputs from the two mixers (at points A and A') contain both upper and lower sidebands. The upper sidebands are removed by the subsequent lowpass filters in each channel. Figure 2 illustrates the spectra at various points.

The remaining lower sidebands (at points B and B') are "folded over" upon themselves, and extend from $0.5F_G$ (where F_G is the width of the baseband spectral gap) to $0.5F_H$ (where F_H is the highest (processed) baseband input frequency).

Highpass filters shown in Fig. 1 have a cutoff frequency equal to $0.5F_G$, and are intended to suppress further any residual energy in the spectral gap due to any imperfection in the filtering in the baseband processing circuits, so that their outputs (points C and C') are relatively devoid of energy from 0 Hz to $0.5F_G$.

Following the highpass filtering, a DC component (referred to in Fig. 1 as "Pilot Ref.") is added to both the inphase and quadrature channels to effect carrier insertion in the subsequent mixing process. The level of the pilot carrier, ω_c, in the outputs of the mixers can be varied by controlling the magnitude of the DC component (injected at points D and D'). In practice, this may be accomplished by means of baseband-derived DC control voltage, assuring a constant pilot-to-signal ratio.

The outputs of the final mixers (at points E and E') contain both of the "unfolded" upper and lower sidebands, symmetrically superimposed upon the

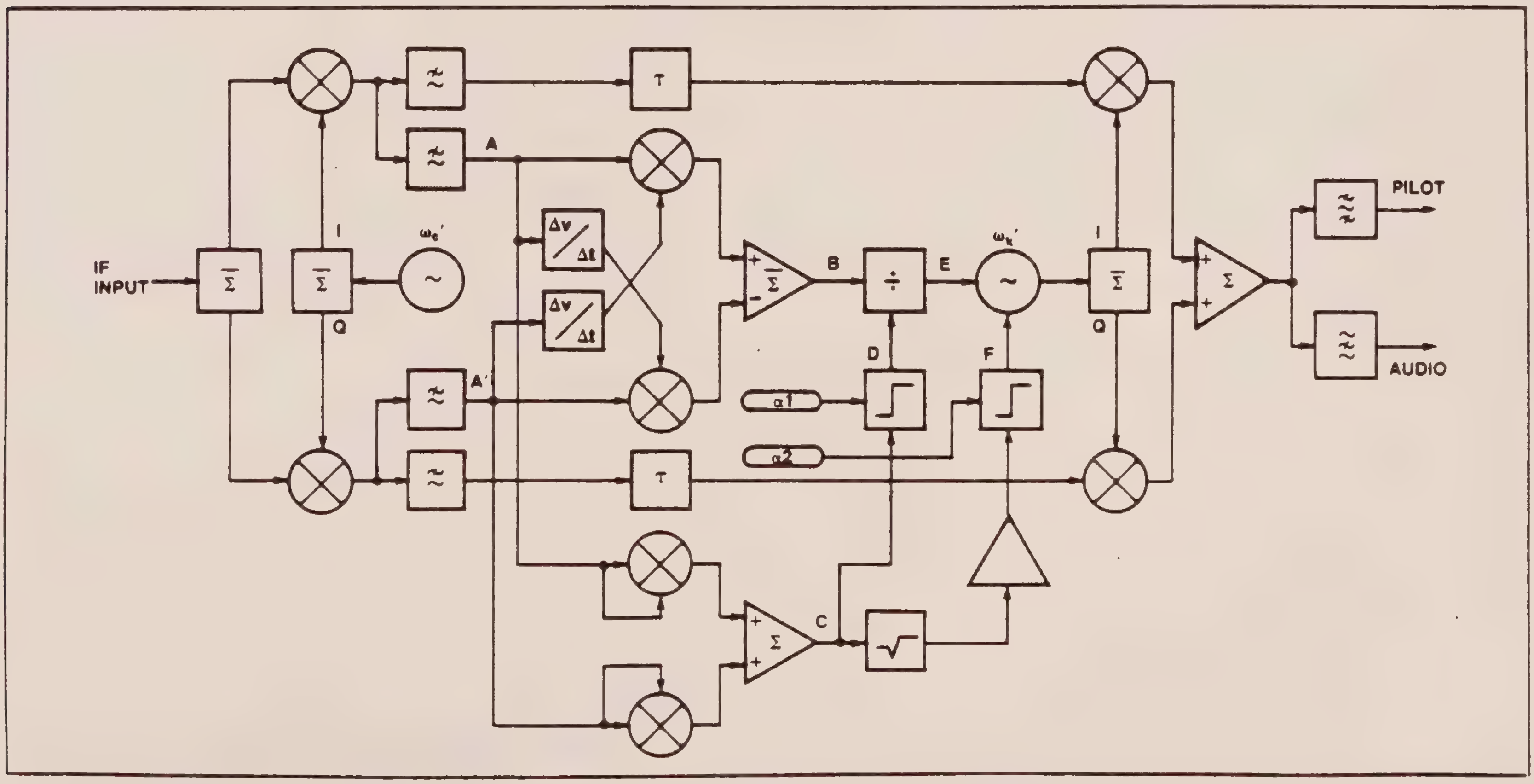

Fig. 4—Unshaded elements comprise basic Weaver demodulator. Shaded elements provide fading correction. Faded DPSB pilot is separated from sideband information, processed by amplitude normalized sine-cosine detector.

(channel-center) pilot carrier, ω_c. The phase relationships of the sidebands in the in-phase and quadrature channels are such that, when summed, the lower sidebands cancel, leaving the upper sideband superimposed upon the pilot carrier with the pilot carrier, ω_c, centered in the spectral gap.

It should be noted that imperfect suppression of the undesired lower sideband due to any imbalance in the circuitry will result only in a slight increase in the apparent level of distortion in the received audio, and not *splatter* into the adjacent channel. This is due to the fact that both the desired and undesired sidebands occupy exactly the same band of frequencies, symmetrically superimposed upon channel center in a "mirror image" fashion, as shown in Fig. 2.

The subsequent frequency conversion and amplification of the resulting IF signal are quite straightforward and therefore will not be further elaborated upon here.

DPFM Mode Transmitter

As shown in Figure 3, the transmission of an FM signal is quite straightforward due to the fact that ω_c is a carrier at channel center in the IF. Since DPFM can be generated by a subset of the functions necessary for DPSB, all that is required is to:

(1) Eliminate the functions shown in dotted outline form in Fig.3 (by executing a subset of the DSP software),

(2) Frequency modulate ω_c with an audio signal, and

(3) Inject the resulting DPFM signal into the IF strip for upconversion to the desired output frequency and amplification prior to transmission.

DPSB Mode Receiver

The received signal is amplified and converted to the IF through conventional means. There is no requirement for stringent IF filtering, such as the sharp, steep-skirted SSB filters found in conventional designs, but some reasonable degree of effort at band-limiting the IF is desirable.

The signal at the IF input (Fig. 4) consists of the pilot carrier and the (superimposed) upper sideband, with the spectrum of both the sideband and the pilot carrier "smeared" and broadened, due to the effects of multipath propagation.

These problems largely can be overcome through the use of the Weaver demodulator and some special, added circuitry which processes the pilot and corrects for the effects of fading, regenerating the pilot and sideband to their original, unfaded spectra during the final stages of demodulation.

In Fig. 4, the basic Weaver demodulator is represented by the unshaded elements, and the additional circuitry for fading correction is represented by the shaded elements. Since the basic Weaver demodulator simply reverses the processes of the modulator and has been well described previously, its functions will not be described in great detail.

After mixing identical samples of the faded IF signal with quadrature components of ω_c' in the first set of mixers, the pilot and the (folded) sideband appear at the outputs of the mixers. The composite signal is band-limited to $0.5F_H$ and delayed (by an amount equal to the delay through the pilot processor) prior to application to the second set of mixers.

The pilot spectrum in the folded baseband at the output of the first set of mixers is contained within a bandwidth equal to the Doppler frequency (twice Doppler prior to "folding" in the mixers), and is recovered at points A and A'

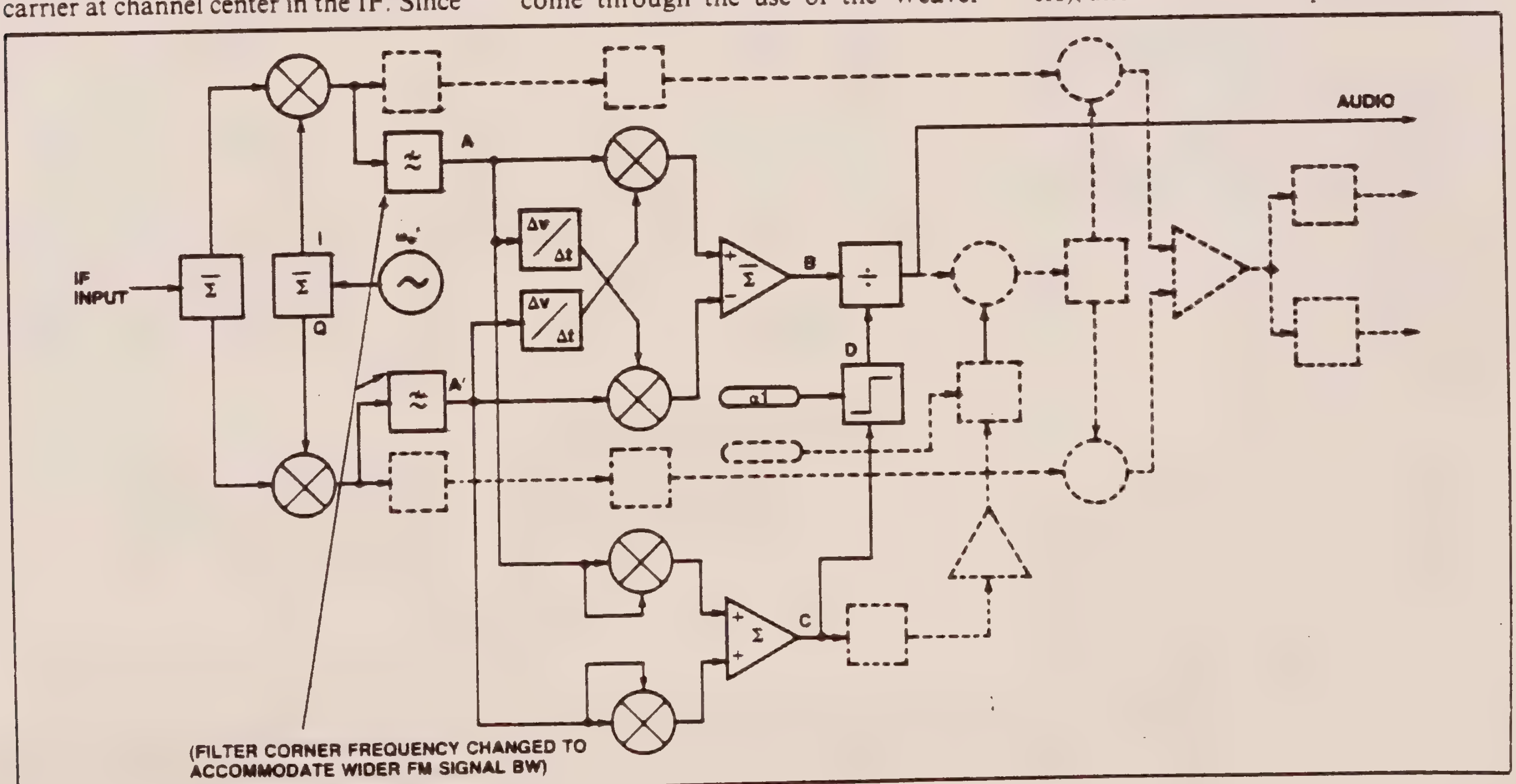

Fig. 5—FM reception with DPMM receiver uses subset of digitally processed single sideband (DPSB) detection process. Solid lines illustrate minor changes executed by different software routine on digital signal processing (DSP) chip. Text details minor functional differences.

in both channels by lowpass filtering with a corner frequency equal to $0.5F_G$ ($\approx$Doppler frequency). This separates the faded pilot from the sideband information, allowing the pilot to be processed by an amplitude-normalized sine-cosine detector to effect the detection of (and correction for) the adverse effects of fading.

If the baseband pilot signals $P_I(t)$ and $P_Q(t)$ at A and A', respectively, (Fig. 4) are represented by:

$$P_I(t) = \frac{R(t)}{2} \sin \phi(t) \qquad (1)$$

and

$$P_Q(t) = \frac{R(t)}{2} \cos \phi(t) \qquad (2)$$

where $R(t)$ is the amplitude of the pilot and $\phi(t)$ is the angular phase/frequency error between ω_c and ω_c', then the signals at the outputs of the two differentiators in Fig. 4 can be represented as:

$$\frac{\Delta_t}{\Delta_t}\left[P_I(t)\right] = \frac{R(t)}{2}\dot{\phi}(t)\cos\phi(t) + \frac{\dot{R}(t)}{2}\sin\phi(t) \qquad (3)$$

and

$$\frac{\Delta_t}{\Delta_t}\left[P_Q(t)\right] = -\frac{R(t)}{2}\dot{\phi}(t)\sin\phi(t) + \frac{\dot{R}(t)}{2}\cos\phi(t) \qquad (4)$$

By cross-mulitplying and subtracting these signals as shown in Fig. 4, a demodulated output signal will be obtained at B which can be represented as:

$$f\left[\dot{\phi}(t)\right] = \frac{R^2(t)}{4}\dot{\phi}(t) \qquad (5)$$

While this signal is proportional to $\dot{\phi}(t)$, the rate of change of phase, it can readily be seen that it is also proportional to $R^2(t)/4$, one fourth of the square of the amplitude variation due to fading. In order to remove this amplitude term and derive pure phase information, the original baseband pilot signals of equations (1) and (2) are squared and summed, producing a signal at C which can be represented as:

$$f\left[R(t)\right] = \frac{R^2(t)}{4} \qquad (6)$$

Dividing (5) by (6) produces an amplitude normalized signal, $\dot{\phi}(t)$ at point E, which is used to control the phase of the freuquency source which generates ω_k'. (A "threshold" [$\alpha 1$] actually is introduced, as shown in Fig. 4, to prevent division by zero, yielding the phase-correction signal at E which is essentially equivalent to (6).)

The output of the amplitude detector at C, represented by equation (6), is processed further to extract its square root yielding [$R(t)/2$], which, after amplification by any appropriate factor, is used to control the amplitude to ω_k' so that it is inversely proportional to the fading pilot's amplitude. Another "threshold" [$\alpha 2$] is introduced at this point, to limit the correction gain as described by McGeehan et al.,[4] producing the actual correction signal at F.

The second mixing process in the Weaver demodulator thus is used to regenerate unfaded versions of both signal and pilot by removing the random amplitude and phase modulations imposed upon them by the fading. This results in the regeneration of the pilot as a single, unspread frequency component at a frequency of ω_k, centered in the spectral gap in the unfolded, recovered sideband.

At this point, relatively simple bandpass and notch filtering will allow separation of the voice and pilot components. The sideband can be processed to return all of its components to their original place in the baseband spectrum, closing the spectral gap and restoring the previously processed speech components to their proper, pre-transmission frequencies. The companding and preemphasis processes can be reversed, followed by audio amplification and reproduction for the listener.

Once the pilot has been regenerated to a single spectral component, it can be utilized effectively as a reference for both long-term AGC and AFC circuitry, if desired. It should be noted that the amplitude and phase-proportional signals already developed for fading correction conceivably might be integrated with a relatively long time constant and employed for the same purpose, with some savings in additional circuitry, depending upon the specific design.

DPFM Mode Receiver

The conversion of the receiver for the reception of FM is, like the transmitter conversion, a subset of the corresponding DPSB process. All that is required is to:

(1) Widen the bandwidth of the lowpass filters, as indicated in Fig. 5, to accommodate the wider FM signal, and

(2) Take the audio output from the point which normally controls the phase of the ω_k' frequency source.

Again, in the DSP implementation, this simply amounts to instructing the DSP chip to execute a slightly different software routine.

Summary

A technology has been developed (DPMM) which allows the transmission and reception of ACSB-like narrowband voice signals with 5.0 kHz channel spacing.

It offers significantly improved performance at higher UHF frequencies and lends itself well to implementation in a digital form, thereby showing a great potential for reducing the size and cost of spectrally efficient mobile radio units.

Furthermore, it is the only technique proposed to date which offers an inherent backward compatibility with current FM technology, thereby making its introduction simpler and more cost-effective than previously proposed narrowband voice techniques.

About The Author

Carl Stevenson undertakes consulting engineering assignments in the areas of land mobile, satellite, and microwave communications equipment and system design. He also has served since June 1984 as Omninet's manager of ground systems engineering.

Prior to his association with Omninet, he was a member of the (NASA/JPL) MSAT project team, where he was involved in the development of advanced systems concepts and technologies for use in satellite-aided mobile communications systems.

His 14-year career in the mobile communications industry also includes periods as a design engineer with several well-known equipment manufacturers, ownership of a mobile radio sales and service business, and a term as managing and technical editor of Communications *magazine.*

Note

The reader is advised that Stevenson has a U.S. patent pending on the technology described in this article and foreign patent rights also are being pursued.

A MODULATION/DEMODULATION SYSTEM FOR BANDWIDTH-EFFICIENT MULTI-MODE MOBILE COMMUNICATIONS

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INTRODUCTION

The preponderance of mobile communications equipments in use by business, industry, and government agencies today employ frequency modulation (FM) techniques. This phenomenon is due, at least in large part, to the relative simplicity of FM transmitting and receiving equipment, but several other factors have historically prompted the continued use of FM as the primary modulation mode for mobile communications systems:

* the basic characteristics of FM, which allow the designer to tailor system performance by varying the modulation index, effectively trading bandwidth for (post-detection) signal to noise ratio improvement;
* the relative immunity of FM to impulse noise (such as that generated by a vehicle's ignition system) and the adverse effects of multipath fading in the mobile environment, at least in areas of comparatively high signal strength, primarily due to the "limiting" action of FM receivers and the constant envelope nature of FM signals; (and)
* the fact that, at least in the past, spectrum was "cheap" compared to the somewhat more complex hardware required for other modulation modes.

These reasons were once quite valid. The use of FM was an expedient, efficient, and cost-effective choice in the past, when circuit complexity had a direct and dramatic impact on the cost of equipment and spectrum was available in abundance, but the situation has changed markedly. Spectral resources are no longer "cheap."

The number of mobile radio units in use has grown dramatically in recent years resulting in spectral congestion, ranging in degree from mild to extremely severe, in all but the most remote and rural areas. To make matters even worse, all reasonable projections indicate that the demand for mobile communications services will continue to grow at an ever increasing rate in the future.

As demand for services has increased, the channels in the mobile radio bands have been split to a point which presently approaches the practical limit for FM, resulting in the present 25 or 30 kHz channel spacing (depending upon which band is being referred to). In many areas, 12.5 or 15 kHz channel spacings, known as "split-split," or "tertiary" channels are in heavy use in the bands and services where such practices are permitted.

Additionally, the heavy demand, the limited number of available channels, and economic and competitive factors have forced reductions in the geographic separation between co-channel systems in some services. In the larger urban areas, there may be as many as four or five co-channel systems within "hearing distance" of each other, each with different groups of users several hundred mobile units ... all competing for the use of the same channel!

Trunking techniques, clever system engineering, frequency co-ordination, and the like have provided some limited relief from co-channel interference, but the 800 MHz trunking channels are all assigned (and rapidly filling up in the urban areas, too). As an example, one five channel system in the Los Angeles area reportedly has over 1500 mobiles in operation at this time.

Improvements in the performance of FM equipment, such as better control of out-of-channel transmitter emmissions and more selective receivers have provided relief from adjacent channel interference, but as the available channels become saturated the co-channel interference and congestion problems become more and more serious.

Cellular mobile telephone service, first proposed a number of years ago, but just now "coming on line" (because of lengthly delays in the regulatory process) has been heralded by some as a panacea for the mobile communications user. It does offer increased capacity, reduced waiting time, and other advantages for mobile telephone users, but is hardly the total solution to the problem. This is demonstrated in part by the fact that Ameritech Mobile Communications, Inc., the "wire-

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line" cellular licensee in the Chicago area, has already petitioned the FCC for the allocation of an additional 12 MHz of spectrum to the cellular mobile telephone service, even before the system has been in commercial operation for a full year!

This proposal is unquestionably premature, since additional capacity and (effective) spectral efficiency can be achieved within the present cellular allocations through "cell splitting." It is, however, indicative of the fact that even today's cellular technology's ultimate capacity may (at some point in the future) be strained by the ever-growing demand for service. (Cellular systems currently utilize FM technology with an occupied bandwidth of approximately 26 kHz and 30 kHz channel-channel spacing, with adjacent channel usage prohibited in adjacent cells to provide adequate "guard bands.")

Even if the capacity of present cellular technology was unlimited, major segments of business, industry, and government require dispatch services which cannot be most effectively and economically provided by switched, telephone-like services such as cellular. What they need are relatively simple, "fleet-call" systems which ubiquitously cover wide areas, allowing multiple mobile units to engage in conversations and/or monitor calls. Accomplishing this with cellular technology would be excessively complex and wasteful, since all of the vehicles in a fleet would have to be "tracked" and multiple channels assigned in multiple cells.

FUTURE NEEDS

Clearly, today's FM technology is inadequate in view of future needs. The present levels of spectral congestion and co-channel interference in many services are intolerable, and the problems will only continue to be exacerbated until acceptable means are developed to reduce the bandwidth necessary for transmissions in the mobile radio services. Such means must of necessity simultaneously provide a number of attributes in order to be fully acceptable in all of the required senses (operational, economic, and regulatory):

* provide acceptable performance and voice quality, despite the severe channel impairments inherent at the higher frequencies in the mobile environment, permitting one technique to be used universally throughout the various land mobile bands;

* utilize techniques which make use of available and inexpensive integrated circuits to the maximum extent possible and/or can be conveniently and implemented in integrated circuits, to reduce both the size and cost of the equipment;

* achieve the maximum possible degree of compatibility and circuit commonality with existing FM systems, to ease its introduction into already overcrowded land mobile bands;

* provide for bandwidth efficient transmission of digital data; (and)

* eliminate, wherever possible, the requirement for bulky and/or expensive parts, tuning adjustments, and reliance on excessively tight component tolerances for performance and stability.

MEETING THE NEEDS

A new technology dubbed Digitally Processed Multi-mode Modulation (DPMM) has a strong potential for meeting all of the above-mentioned needs. It's a modulation and demodulation system which uses digital signal processing (DSP) techniques to provide an advanced form of ACSB (DPSB), complete backward compatibility and interoperability with FM (DPFM), and the capability of readily transmitting digital data in either the DPSB or DPFM modes - all with the same compact, cost-effective hardware!

Because of DPMM's extensive use of readily available, off the shelf, very large scale digital integrated circuits (VLSI's), DPMM radios will be economical to produce; reliable; and, despite their comparative complexity, easy to service.

The vast majority of the complexity will be "buried" in a very small handful of digital VLSI's, there will be very few tuning adjustments in DPMM radios and most repairs will be effected by a simple replacement of one of the IC's.

ADVANTAGES OF DPMM

If the significance of DPMM is not immediately apparent, consider the following factors:

* the ease with which DPMM can be phased into bands and systems where traditional FM equipment is in use;

* the utility of a radio which could communicate in the DPSB mode via the proposed land mobile satellite system when the user is in remote areas (for bandwidth and power efficiency through the spacecraft), but could function as an FM cellular mobile telephone when the user returns to a more densely populated area where cellular service is available; (and)

* the probability that, in time, the cellular service itself could be very gracefully converted to the use of the DPSB mode through the gradual introduction of DPMM radios (the initial operation would be FM, with a phased conversion as more and more DPMM radios were placed into service - the eventual result would be much higher capacity in the same frequency allocation, due to the availability of approximately six times more channels than the with present FM-based technology).

PRINCIPLES OF OPERATION

The basic principles of operation of DPMM can most easily and briefly be described in terms of its conceptual parent - a functionally equivalent analog implementation. The reader is cautioned to remain aware that there may not always be a direct "functional block" to "functional block" correspondence between the digital implementation and this analog equivalent thereof. In fact, a simple analog form may not be realizable at all, due to the fact that digital signal processing sometimes allows the designer to draw upon a "bag of tricks" which have no directly, conveniently realizable counterparts in the analog world (due to the limitations of analog components).

The conceptual basis for the SSB modulation and demodulation is the Weaver modulator. While this method of generating and detecting SSB signals was first described in the literature in 1956 [1], it has not, to date, seen significant use in practical applications. At the time this method was first proposed, the state-of-the-art in component technology made it impractical, due to its requirements for the generation of very accurate quadrature phase shifts at both RF and AF frequencies and close gain, phase, and delay matching between its two signal channels. Recent improvements in component technology have largely removed these barriers, making it a practical and economical alternative to more conventional SSB methods.

TRANSMITTER DESCRIPTION - DPSB MODE

The SSB transmitter incorporates a Weaver modulator, modified to include highpass filtering and carrier insertion. For the sake of simplicity, some of the basic audio processing circuitry and the final transmitter stages have been omitted from Figure 1, since they are comparatively straightforward. It is assumed that the audio input will be band-limited, compressed, preemphasized, and processed in a fashion similar to that described for the "TTIB" method by McGeehan et al. [2], so that the audio baseband exhibits a mid-band spectral gap of twice the expected Doppler frequency, plus some allowance for imperfect filtering.

Referring to Figure 1 (from left to right), the processed audio input signal is split into two in-phase components of equal magnitude and applied to the first set of mixers, where they are mixed with two quadrature-phase components of ω_k, which is an audio frequency "sub-carrier" with a frequency equivalent to the center of the processed baseband signal.

The resulting outputs from the two mixers (at points "A" and "A'") contain both upper and lower sidebands. The upper sidebands are removed by the subsequent lowpass filters in each channel. (Figure 2 illustrates the spectra at various points throughout the transmitter.)

The remaining lower sidebands (at points "B" and "B'") are "folded over" upon themselves, and extend from 0.5FG (where FG is the width of the baseband spectral gap) to 0.5FH (where FH is the highest [processed] baseband input frequency).

The highpass filters have a cutoff frequency equal to 0.5FG, and are intended to further suppress any residual energy in the spectral gap due to any imperfection in the filtering in the baseband processing circuits, so that their outputs (points "C" and "C'") are relatively devoid of energy from 0 Hz to 0.5FG.

Following the highpass filtering, a DC component (referred to in Figure 1 as "Pilot Ref.") is added to both the in-phase and quadrature channels to effect carrier insertion in the subsequent mixing process. The level of the pilot carrier, ω_c, in the outputs of the mixers can be varied by controlling the magnitude of the DC component (injected at points "D" and "D'"). In practice, this may be accomplished by means of a baseband-derived DC control voltage, assuring a constant pilot-to-signal ratio.

The outputs of the final mixers (at points "E" and "E'") contain both of the "unfolded" upper and lower sidebands, symmetrically superimposed upon the (channel-center) pilot carrier, ω_c. The phase relationships of the sidebands in the in-phase and quadrature channels are such that, when summed, the lower sidebands cancel, leaving the upper sideband symmetrically superimposed upon the pilot carrier with the pilot carrier, ω_c, centered in the spectral gap.

Any imperfect suppression of the undesired lower sideband due to any imbalance in the circuitry will result only in a slight increase in the apparent level of distortion in the received audio and not "splatter" into the adjacent channel.

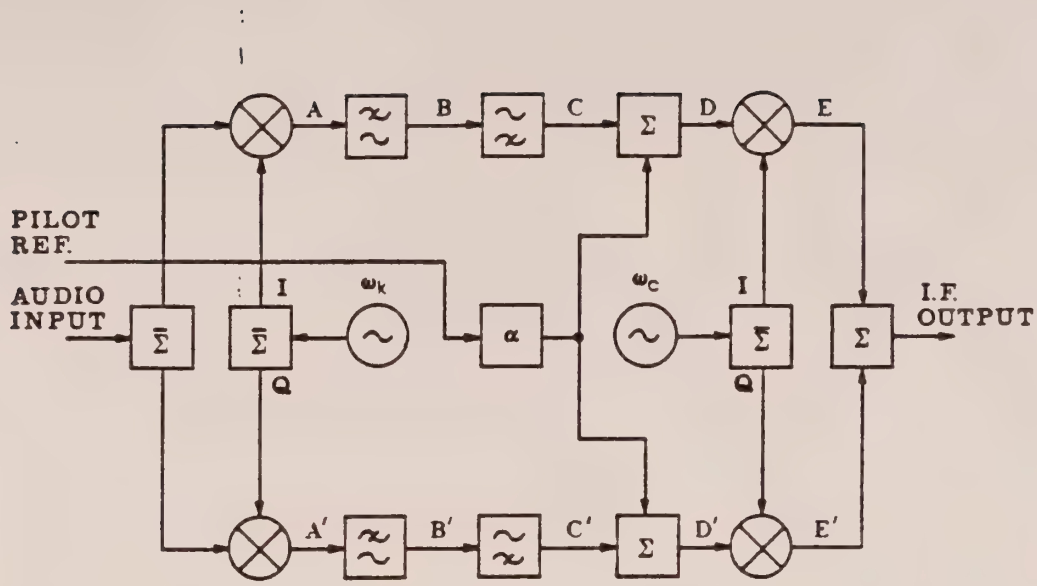


Figure 1 - Transmitter Block Diagram, DPSB Mode

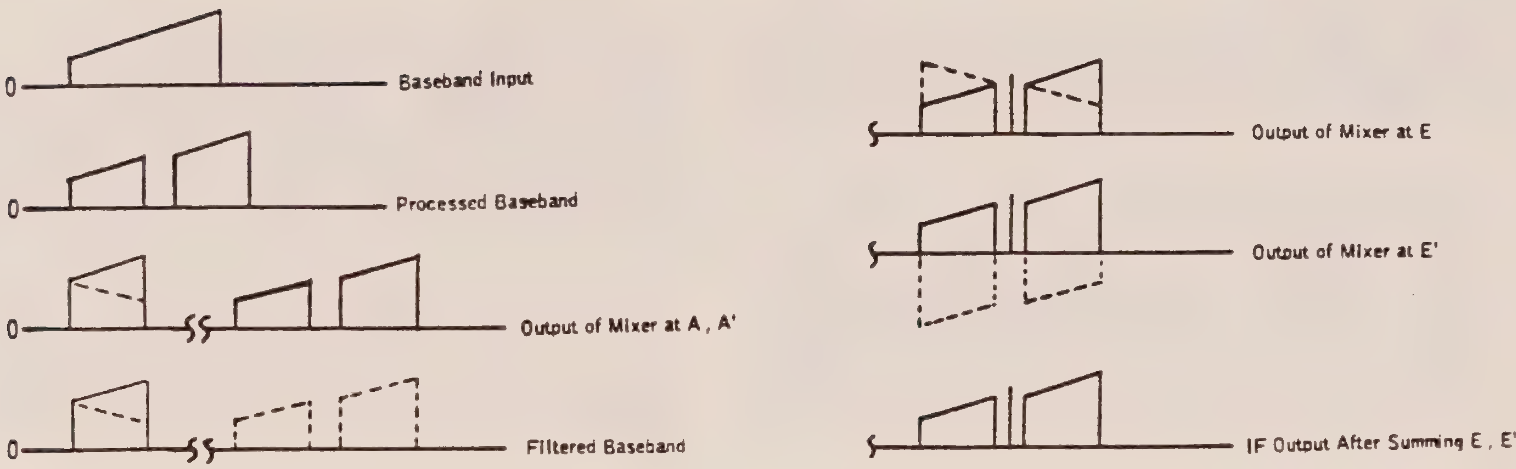


Figure 2 - Depiction of the Spectra at Various Points in the DPSB Transmitter

This is due to the fact that both the desired and undesired sidebands occupy exactly the same band of frequencies, symmetrically superimposed upon channel center in a "mirror image" fashion, as shown in Figure 2.

Since the frequency conversion and amplification of the resulting IF signal are quite straightforward, they not be further elaborated upon here.

TRANSMITTER DESCRIPTION - DPFM MODE

As can readily be seen from Figure 3, the transmission of an FM signal is quite straightforward due to the fact that ω_c is a carrier at channel center in the IF. Since DPFM can be generated by a subset of the functions necessary for DPSB, all that is required is to:

* eliminate the functions shown in dotted outline form in Figure 3 (by executing a subset of the DSP software);
* frequency modulate ω_c with the desired audio input signal; (and)
* inject the resulting DPFM signal into the IF strip for upconversion to the desired output frequency and amplification prior to transmission.

RECEIVER DESCRIPTION - DPSB MODE

The received signal is amplified and converted to the IF by conventional means. There is no requirement for stringent IF filtering, such as the sharp, steep-skirted SSB filters found in conventional designs, but some reasonable degree of effort at band-limiting the IF is deemed to be desirable.

The signal at the IF input (in Figure 4) consists of the pilot carrier and the (superimposed) upper sideband, with the spectrum of both the sideband and the pilot carrier "smeared" and broadened, due to the effects of multipath propagation.

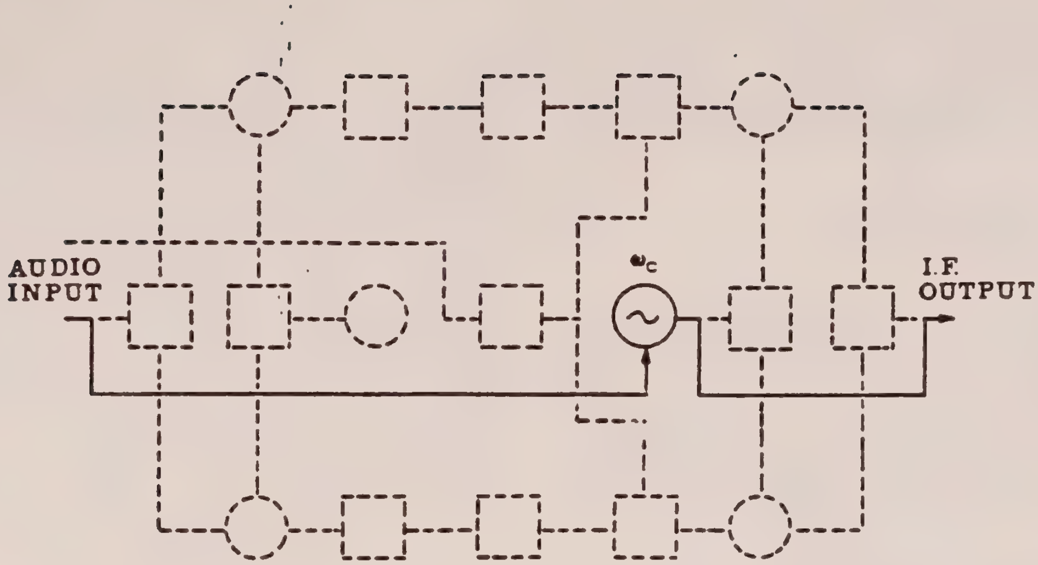


Figure 3 - Diagram Showing the Minor Changes Necessary for DPFM Transmissions

These problems can be largely overcome through the use of the Weaver demodulator and some special, added circuitry which processes the pilot and corrects for the effects of fading, regenerating the pilot and sideband to their original, unfaded spectra during the final stages of demodulation.

In Figure 4, the basic Weaver demodulator is represented by the unshaded elements, and the additional circuitry for fading correction is represented by the shaded elements. Since the basic Weaver demodulator simply reverses the processes of the modulator and has been quite well described in the literature previously, its functions will not be described in great detail.

After mixing identical samples of the faded IF signal with quadrature components of ω_c' in the first set of mixers, the pilot and the (folded) sideband appear at the outputs of the mixers. The composite signal is band-limited to 0.5FH and delayed (by an amount equal to the delay through the pilot processor) prior to application to the second set of mixers.

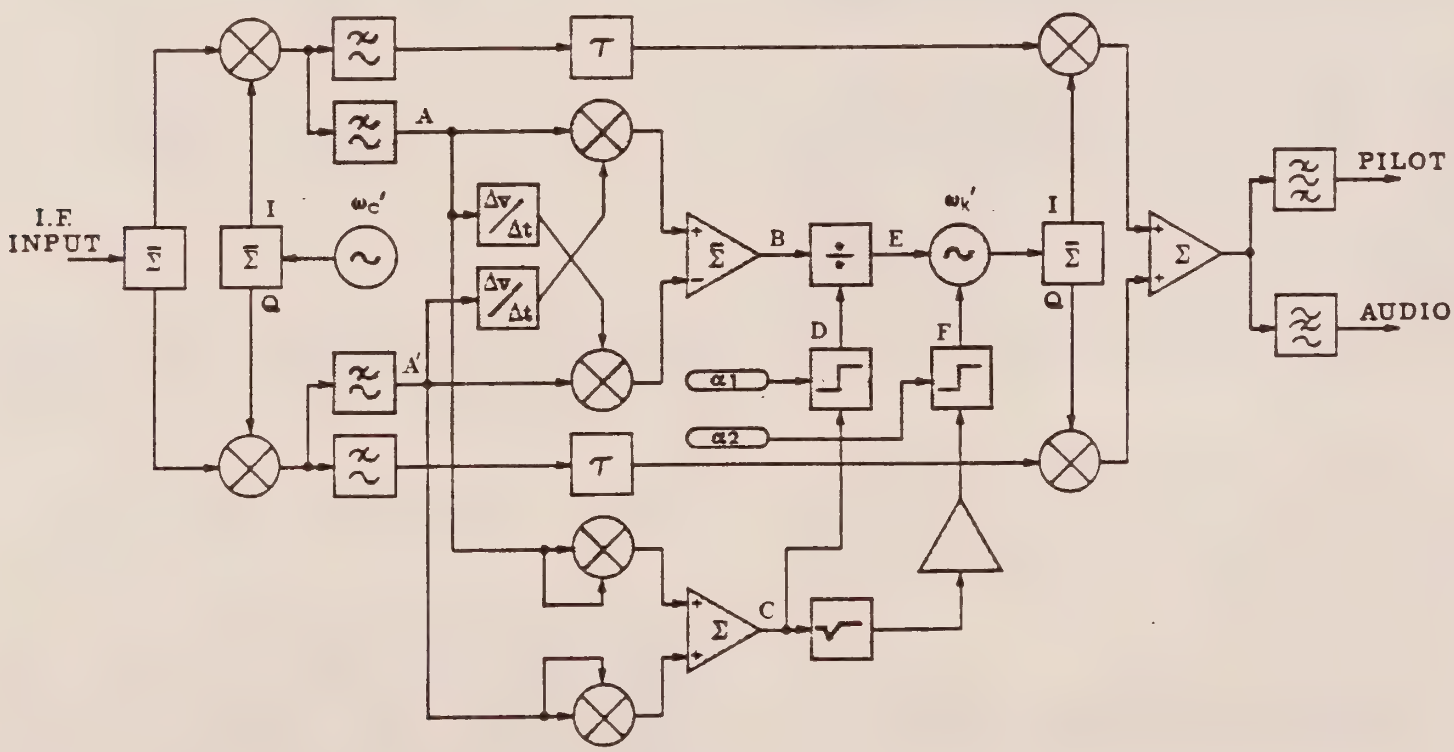


Figure 4 - Receiver Block Diagram, DPSB Mode

The pilot spectrum in the folded baseband at the output of the first set of mixers is contained within a bandwidth equal to the Doppler frequency (twice Doppler prior to "folding" in the mixers), and is recovered at points "A" and "A'" in both channels by lowpass filtering with a corner frequency equal to 0.5FG (~ Doppler frequency). This separates the faded pilot from the sideband information, allowing the pilot to be processed by an amplitude-normalized sine-cosine detector [3] to effect the detection of (and correction for) the adverse effects of fading.

If the baseband pilot signals $P_I(t)$ and $P_Q(t)$ at "A" and "A'", respectively, in Figure 4 are represented by:

$$P_I(t) = \frac{R(t)}{2} \sin\phi(t) \qquad (1)$$

and

$$P_Q(t) = \frac{R(t)}{2} \cos\phi(t) \qquad (2)$$

where $R(t)$ is the amplitude of the pilot and $\phi(t)$ is the angular phase/frequency error between ω_c and ω_c', then the signals at the outputs of the two differentiators in Figure 4 can be represented as:

$$\frac{\Delta_v}{\Delta_t}(P_I) = \frac{R(t)}{2} \dot{\phi}(t)\cos\phi(t) + \frac{\dot{R}(t)}{2} \sin\phi(t) \qquad (3)$$

and

$$\frac{\Delta_v}{\Delta_t}(P_Q) = -\frac{R(t)}{2} \dot{\phi}(t)\sin\phi(t) + \frac{\dot{R}(t)}{2} \cos\phi(t) \qquad (4)$$

By cross-multiplying and subtracting these signals as shown in Figure 4, a demodulated output signal will be obtained at "B" which can be represented as:

$$f(\phi) = \frac{R^2(t)}{4} \dot{\phi}(t) \qquad (5)$$

While this signal is proportional to $\dot{\phi}(t)$, the rate of change of phase, it can readily be seen that it is also proportional to $R^2(t)/4$, one fourth of the square of the amplitude variation due to fading. In order to remove this amplitude term and derive pure phase information, the original baseband pilot signals of equations (1) and (2) are squared and summed, producing a signal at "C" which can be represented as:

$$f(R) = \frac{R^2(t)}{4} \qquad (6)$$

Dividing (5) by (6) produces an amplitude normalized signal, $\dot{\phi}(t)$ at point "E", which is used to control the phase of the frequency source which generates ω_k' . (A "threshold" [a1] is actually introduced, as shown in Figure 4, to prevent division by zero, yielding the phase-correction signal at "E" which is essentially equivalent to (6).)

The output of the amplitude detector at "C", represented by equation (6), is further processed to extract its square root yielding $R(t)/2$, which, after amplification by any appropriate factor, is used to control the amplitude of ω_k' so that it is inversely proportional to the fading pilot's amplitude. Another "threshold" [a2] is introduced at this point, to limit the correction gain as described by McGeehan et al. [4], producing the actual correction signal at "F".

The second mixing process in the Weaver demodulator is thus used to regenerate unfaded versions of both signal and pilot by removing the random amplitude and phase modulations imposed upon them by the fading. This results in the regeneration of the pilot as a single, unspread frequency component at a frequency of ω_k , centered in the spectral gap in the unfolded, recovered sideband.

At this point, relatively simple bandpass and notch filtering will allow separation of the voice and pilot components. The sideband can be processed to return all of its components to their original place in the baseband spectrum, closing the spectral gap and restoring the previously processed speech components to their proper, pretransmission frequencies; the companding and preemphasis processes can be reversed; followed by amplification and reproduction for the listener.

RECEIVER DESCRIPTION - DPFM MODE

The conversion of the receiver for the reception of FM is, like the transmitter conversion, a subset of the corresponding DPSB process. All that is required is to:

* widen the bandwidth of the lowpass filters, as indicated in Figure 5, to accommodate the wider FM signal (and)

* take the audio output from the point which normally controls the phase of the ω_k' frequency source.

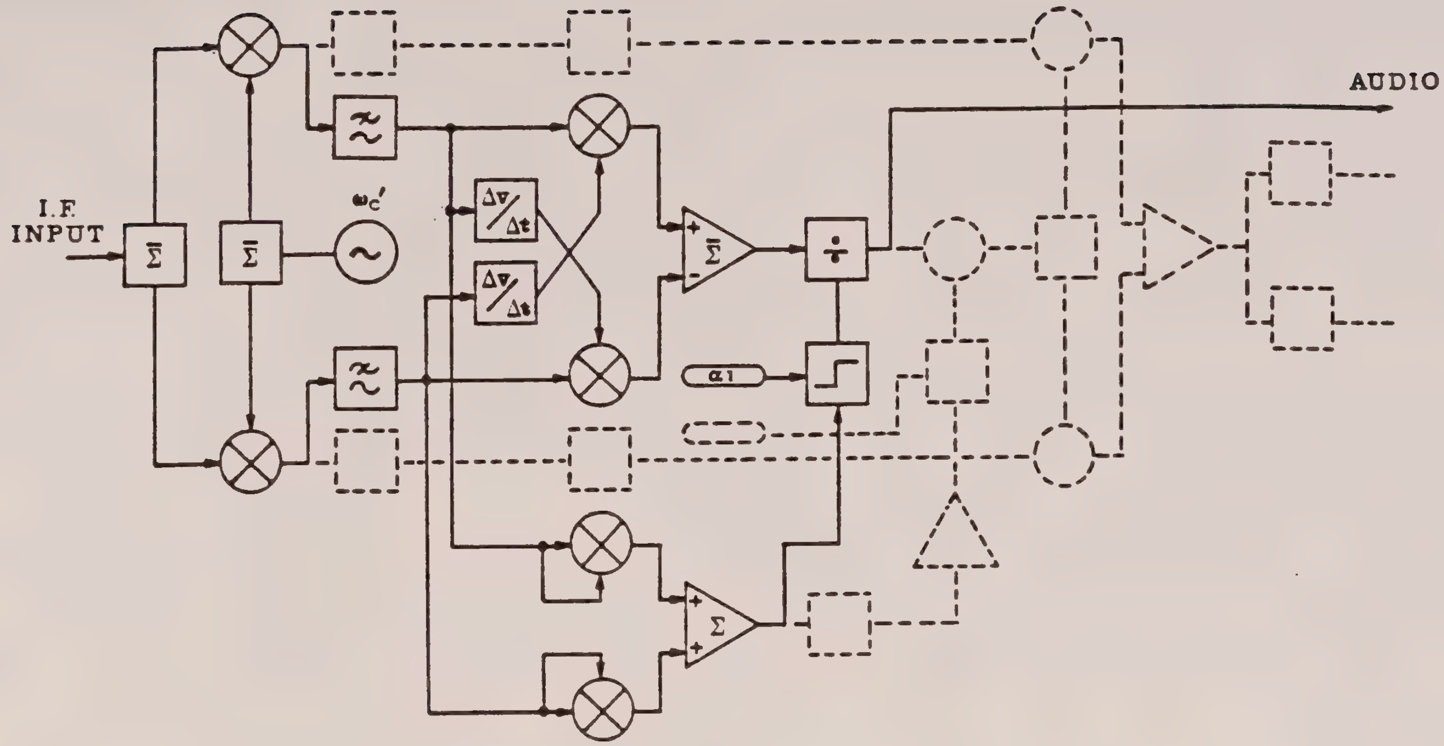


Figure 5 - Diagram Showing the Minor Changes Necessary for DPFM Reception

SUMMARY

A technology has been described (DPMM) which will allow the transmission and reception of ACSB-like narrowband voice signals with 5.0 kHz channel spacing.

It offers the possibility of significantly improved performance at higher UHF frequencies and lends itself well to implementation in a digital form, thereby showing a great potential for reducing the size and cost of spectrally efficient mobile radio units.

Furthermore, it is the only technique proposed to date which offers an inherent backward compatibility with current FM technology, thereby making its introduction simpler and more cost-effective than previously proposed narrowband voice techniques.

NOTE ON PATENT RIGHTS

The reader is hereby advised that Mr. Stevenson has a U.S. Patent pending on the technology described in this paper and foreign patent rights are also being pursued.

REFERENCES

[1] Weaver, D.K., Jr.: "A Third Method of Generation and Detection of Single-Sideband Signals", Proc. IRE, Vol. 44, pp. 1703-1705, December 1956.

[2] McGeehan, J.P. et al.: "Pilot Tone Single Sideband for Mobile Satellite Communications", Proc. IEEE Third Intl. Conference on Satellite Systems for Mobile Communications and Navigation, London, June 1983

[3] Goatcher, J.K. et al.: "Noise Considerations in an Integrated Circuit VHF Radio Receiver", Proc. IERE Conference on Radio Receivers and Associated Systems", Leeds, England, July 1981, pp. 49-59.

[4] McGeehan, J.P. et al.: "Theoretical and Experimental Investigation of Feedforward Signal Regeneration as a Means of Combating Multipath Propagation Effects in Pilot-Based SSB Mobile Radio Systems", IEEE Transactions on Vehicular Technology, Vol. VT-32, No. 1, February 1983.

2.3. Modulation Requirements

The data transmission rate and the occupied bandwidth of the resulting modulated radio signal are inherently related, with higher data rates requiring proportionately wider bandwidths. Since (1) the System is (and can only be) licensed for a maximum authorized bandwidth of 20 kHz on the existing frequency of 155.34 MHz; (2) the existing radio equipment must be utilized, if at all feasible, to minimize additional costs, and (3) a major goal of this program is to facilitate the rapid transmission of information; very thoughtful consideration must be given to the selection of the modulation technique which will allow the highest possible data rate consistent with the existing bandwidth and equipment constraints.

2.4. Description of GMSK

The optimum modulation technique, particularly considering these constraints, is a technique known as Gaussian-filtered Minimum Shift Keying ("GMSK"). It is a form of minimum shift keying ("MSK") ... effectively "direct digital FM" with baseband data pulse shaping prior to modulation of the carrier to restrict its signal's spectral occupancy.

GMSK provides excellent performance within a modest occupied bandwidth and can also be generated and detected with much less complicated circuitry than most other digital modulation forms, resulting in the more practical and economical modifications to the existing GE radio equipment. (See Figure 2-1)

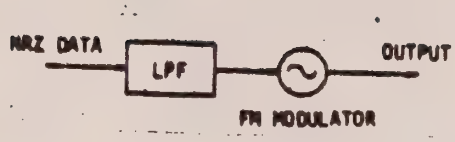


Fig. 2-1: Basic Implementation of GMSK

2.4.1. Spectral Characteristics of GMSK

As stated above, GMSK provides a very spectrally-efficient means of data transmission.

Figure 2-2 shows the computed power spectrum of GMSK signals versus the normalized frequency difference from the carrier center frequency $(f - f_c)T$ for various values of B_bT, the normalized premodulation Gaussian LPF 3 dB bandwidth. As is clearly indicated, B_bT is the effective parameter and can be selected by the system designer to tailor the overall spectral occupancy of the resulting signals.

Figure 2-3 shows the computed ratio of the out-of-band power in the adjacent channel to the total power in the desired channel where the normalized channel spacing is taken as the abscissa and both channels are assumed to have the ideal rectangular bandpass characteristic B_iT. The situation of $f_sT=1.5$ and $B_i=1$ would correspond directly to the case of $f_s \approx 25$ kHz and $B_i=16$ kHz when $f_b=1/T=16$ kbits/s.

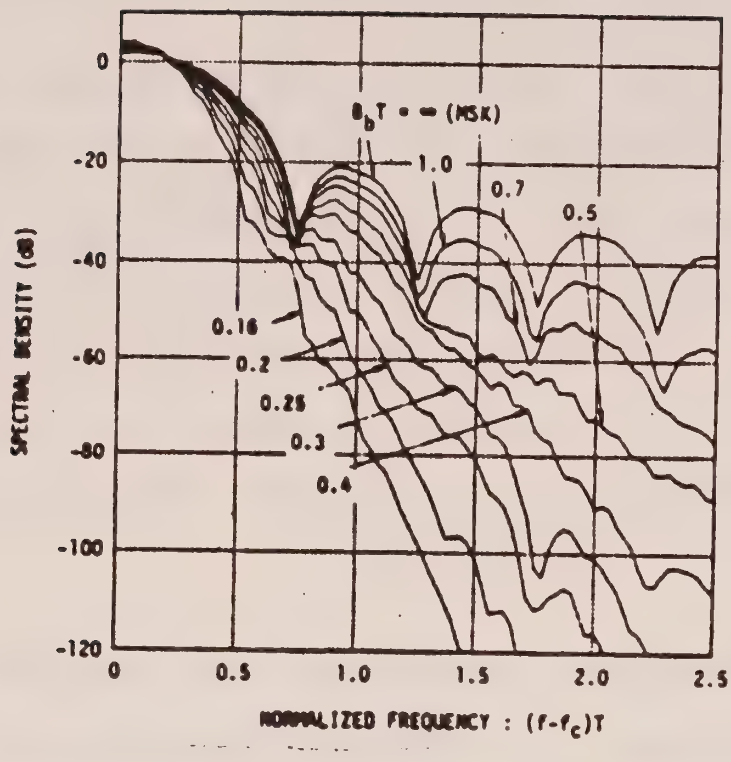


Fig. 2-2: Computed Power Spectra of GMSK

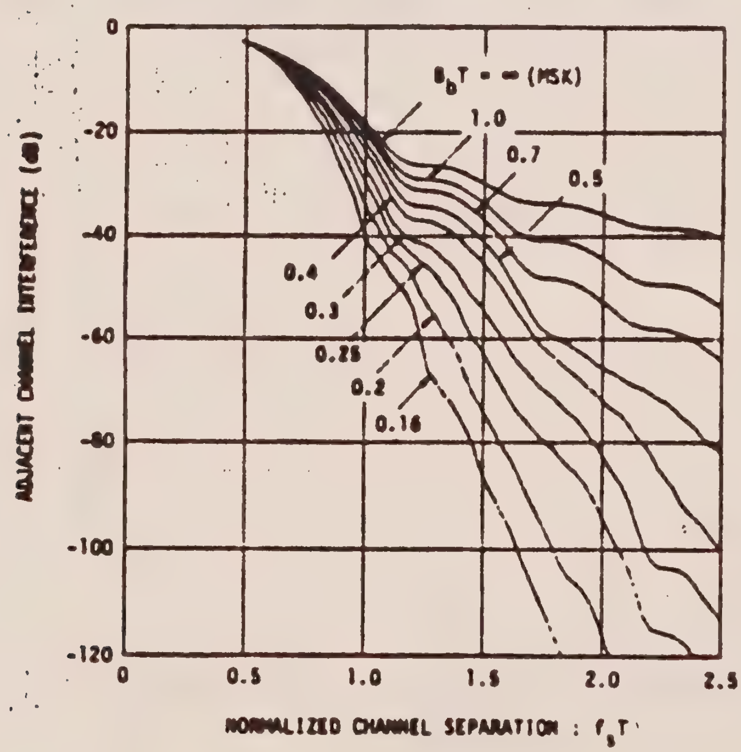


Fig. 2-3: Adjacent Channel Interference of GMSK

2.4.2. BER Performance Characteristics of GMSK

GMSK provides very good "raw channel" bit error rate performance characteristics, generally exhibiting BERs in the 10^{-5} range for an E_b/N_o of only about 11 dB under static propagation conditions such as the base-to-base communications situation involved in the System. BERs in the 10^{-6} range and better can be achieved with comparative ease as the E_b/N_o exceeds approximately 14-16 dB, depending to some degree on the B_bT in question.

Figure 2-4 shows the performance degradation of GMSK compared to an ideal antipodal transmission, demonstrating that the loss of performance due to intersymbol interference generated in the premodulation LPF is only approximately 1.2 dB for a B_bT of as small as 0.2 and that at a B_bT of at least 0.25 it does not exceed 0.7 dB.

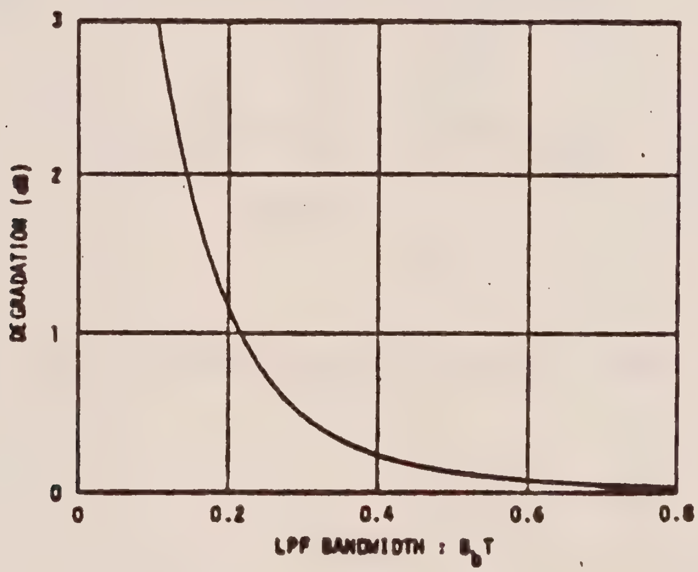


Fig. 2-4: Theoretical E_b/N_o Degradation of GMSK

Figure 2-5 shows the static BER performance of GMSK for various values of B_bT and E_b/N_o. It illustrates further that GMSK provides excellent BER performance and can very closely approach the performance of theoretically ideal antipodal modulation forms for reasonable and spectrally-acceptable values of B_bT.

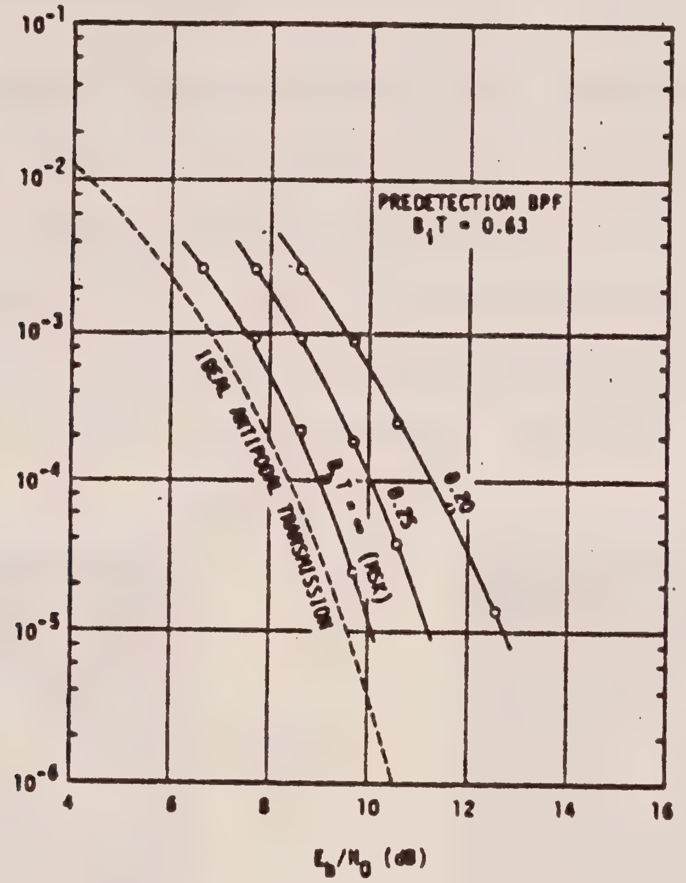
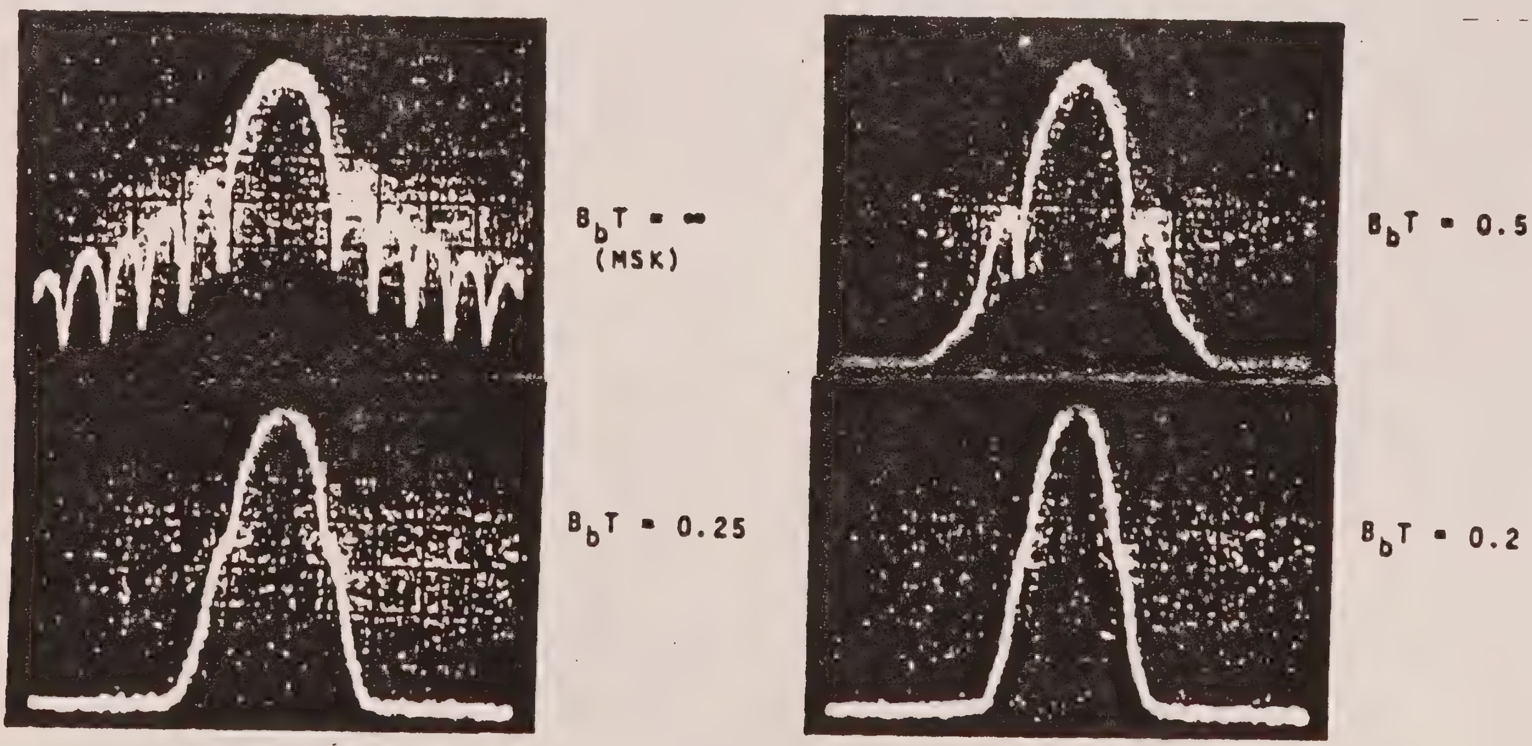


Fig. 2-5: Static BER Performance of GMSK

2.4.3. Achievable Bit Rates With GMSK

GMSK modulation with a B_bT in the range of 0.2 to 0.5 can provide suitable spectral characteristics and BER performance for the [illegible] System application at data rates of at least 9600 bits per second, with a reasonable expectation of the possibility of 16K bits per second being achievable in the allowable channel bandwidth, subject to further investigation and experimentation during the early phase of the project.

Figure 2-6 shows the measured power spectrum of GMSK signals with various B_bT values at a data rate of 16 kbits/s. It must be recognized that these results were obtained with optimal radios, specifically designed for GMSK. Modified GE radios may or may not be capable of achieving 16 kbits/s in the allowable bandwidth and this rate should be considered an ideal goal rather than a guaranteed transmission rate.



Measured power spectra of GMSK (*V*: 10 dB/div., *H*: 10 kHz/div.).

Subject: Packet radio files available from SIMTEL20
From: W8SDZ@SIMTEL20.ARPA (Keith Petersen)
Path: fortune!hpda!hplabs!hao!seismo!brl-tgr!tgr!W8SDZ@SIMTEL20.ARPA
Newsgroups: net.ham-radio
Date: 26 May 85 18:11:55 GMT
Sender: news@brl-tgr.ARPA

Thanks to Don Merrit <merritt@BRL.ARPA> we now have the two Packet Radio files recently announced to packet-radio@MIT-EDDIE.ARPA.

Now available from SIMTEL20, via ANONYMOUS ftp with password GUEST:

Filename	Type	Bytes	CRC
Directory MICRO:<CPM.PACKET>			
ROUTING.TXT.1	ASCII	28795	2D49H
TCP-IP.TXT.1	ASCII	56129	368BH

73, --Keith Petersen
Arpa: W8SDZ@SIMTEL20.ARPA
uucp: ...!{decvax,unc,hao,cbosgd,seismo,aplvax,uci}!brl-bmd!w8sdz
uucp: ...!{ihnp4!cbosgd,cmcl2!esquire}!brl-bmd!w8sdz

Subject: Re: Re: Re: Standards for commercial pac
From: jbn@wdl1.UUCP
Path: fortune!wdl1!jbn
Organization: Ford Aerospace, Western Development Laboratories
Newsgroups: net.dcom
Date: 28 Aug 85 03:29:22 GMT
Sender: kimery@wdl1.UUCP

Datagram systems have some serious problems. Here are a few of them.

1. In a pure datagram system, with no link-level retransmission, the probability of successfully forwarding a packet througn N nodes declines exponentially with the number of nodes. Ham users of digipeaters and UNIX users of async links for IP datagrams are painfully aware of this phenomenon. You really do need link-level retransmission in any sizable datagram system, unless the medium has very low error rates.

2. Congestion is a serious problem in datagram systems. No really good general solutions are known. I've solved some problems associated with some of the simpler cases (IP/TCP via Ethernet to slow link gateways) but a general solution is still elusive. There are tough theoretical problems here; there may be a way to organize an arbitrarily large datagram network, but it hasn't been discovered yet. Telephony has been around long enough that we know how to build very large virtual circuit networks.

3. Datagram networks tend to break down when fully loaded; this is a consequence of (2) above. There are ways around this, but they involve running the system in a derated mode, where keeping all links as busy as possible is not attempted. The ARPANET technology really works only because the ARPANET has substantially more link bandwidth than it needs for its traffic volume; this is a well known problem. TELENET started out with ARPANET technology but has since gone to virtual circuits internally to get better link utilization. In any case, the IMP svstem of the ARPANET is not a true datagram system internally, although it exports a datagram interface.

4. Datagram systems have some serious vulnerabilities. One bad guy can hog the network and clog up the links. Datagram systems tend to rely on hosts being well-behaved. With virtual circuits, the network has a positive throttle over host traffic generation, and can keep bad hosts from interfering with other traffic. In networks with no central administrative authority over hosts, this is a serious problem in practice. The ARPANET/MILNET gateways are already under serious strain because of this exact problem. Tight standards and anti-bad-guy queuing algorithms in nodes can solve this problem; unfortunately the Internet lacks both.

5. Accounting is difficult in datagram systems. What should a phone bill for a datagram net look like? Histograms of traffic by time and destination? Just a total amount? The network may need to recognize clumps of packets for similar destinations and treat them as a ''call'' for billing purposes.

This may sound odd coming from me, as a builder of datagram gateways. But datagram systems are useful in the military environment, where the important

thing is to keep going despite serious failures, not achieve maximum throughput under optimal conditions. They may be useful for other purposes, if the problems above are addressed. But a simple virtual circuit network (a la Tymnet) behaves better than a simple datagram network (a la Internet) given the same bandwidth.

John Nagle

From: Phil Karn, KA9Q
To: The ARRL Ad-Hoc Digital Communications Committee
Subject: Progress on "Level 3"

This letter is prompted by Paul Rinaldo's recent letter to the ARRL Digital Committee commenting on the apparent lack of progress in "level 3". I have thought at lot about the issues I will raise here, and if my comments seem blunt, please understand that I am only calling the shots as I see them. I feel I must express them if am to continue with my own R&D efforts in amateur packet radio. Any constructive and thoughtful responses would be most welcome.

It seems to be "in" these days to ridicule the networking protocol debates and to proclaim oneself to be in the "D.C." (Don't Care) camp. I don't know how much people know about the history of packet switching outside amateur radio, but I believe I am qualified to make the following observation:

"Like diamonds or herpes, but unlike hardware or software, protocols are (virtually) forever."

TNC designs come and go. Sooner or later, every software package is rewritten or discarded. However, even those protocols intended by their designers as short term stopgaps have a nasty habit of staying around a lot longer than anyone expects. When they finally do die, it is only through considerable effort and much knashing of teeth. I could cite plenty of examples, but this point ought to be obvious to everyone.

This is why I consider these discussions, as tedious as they may be to some, to be extremely important. As amateurs, we have a natural tendency to punt on theory, preferring instead to get our hands dirty. This is fine, as long as you're not playing with quick-setting concrete. Two minutes after adding the water is no time to start thinking about the shape you want for your house's foundation...

In addition to the choice between datagram or virtual-circuit oriented network and transport protocols, there are plenty of other equally important issues to be discussed and decided, e.g.,

1. Addressing. Variable or fixed length? Hierarchical or flat? Position independent? Central or distributed assignment? What organization(s), if any, should assign them?

2. Routing. This one has long been a fertile research area in computer science, but plenty of workable

algorithms exist. A network without some form of automatic routing is, in my opinion, nearly a toy. Amateurs have a real opportunity to contribute to the state of the art in this area.

3. Channel access algorithms. Our channels are highly susceptible to "congestion collapse," and this is perhaps the biggest single cause of the lousy efficiency of our current networks. However, I know of no one working on or even considering some of the existing, published methods that keep CSMA channels stable under heavy load.

4. Network reconfigurability. An amateur network, more than any other, is characterized by constant change. For many reasons, nodes come and go constantly. Link availability is often unpredictable. Stations can relocate at will; some may even be operated in motion. Besides being an important advantage of datagrams over virtual circuits, reconfigurability must be considered in any network addressing plan. It also increases the already urgent need for an automatic routing algorithm that can adapt to rapid change.

And so on. These issues are so important that we can't afford to have just two people working on them. There needs to be informed discussion by as many people as possible who are willing to spend time reviewing the outside literature and to think hard about the problems to be solved. This needs to be done before we continue to grow amateur packet radio by ad-hoc trial-and-error, and before more money is spent on hardware that might be leading us down dead-end streets.

In my opinion, the ARRL Ad Hoc Digital Committee has so far largely abdicated its leadership responsibilities by proclaiming a coding race (they called it a "period of experimentation," but we know better). Consider the AM stereo fiasco (where the FCC opted to "let the market decide") or the continuing VHS/Beta VCR format war. This is what happens when conflicts between competing standards are not resolved before so much is invested in each one that a "format war" is inevitable. In these two examples it is clear that any technical advantage one standard might have over the other is dwarfed by the market confusion and duplication of effort that comes from developing and deploying several incompatible standards. It is also clear that an implementation race is not the way to determine which standard is "better" in the long term. Decisions need to be made before significant resources are expended, and before compatibility with existing systems becomes an

overriding concern. Frankly, I am not willing to expend much of my time on a TCP/IP implementation unless it has a good chance of becoming the accepted standard. Of course, implementations alone do not a network make, as stated earlier.

So far, I have received virtually no feedback from any of the Committee members on the issues Terry, Gordon and I raised in our San Francisco Conference papers, or elsewhere for that matter. Despite the ongoing "period of experimentation," to my knowledge few Committee members are themselves doing any serious "level 3 experimentation" or even examining the experiences of other networks. Amateurs did not invent packet switching, nor did we invent packet radio. In fact, we're doing precious little that hasn't been done before. Wasting our limited resources by repeating the mistakes of others because we're either too lazy or too proud to learn from them is just plain wrong.

Some Committee members seem to expect that they'll be handed a finished, working, turnkey "Level 3 Product" on a silver platter, without bothering with the boring details. While this "appliance operator" attitude is appropriate for the top management of a software house, this is supposed to be amateur radio, not a commercial enterprise. Even in business, the most successful managers are those who take a keen interest in their employees' work and contribute to their discussions. Above all, a good manager does not ridicule or trivialize an employee's job, unless he is trying to get him to quit. These considerations go double when you're dealing with volunteers.

If the Committee feels that it does not yet have enough information to make a decision regarding standard network and transport layer protocols for amateur packet radio, I suggest that we contact some more people active in a variety of commercial and research networking areas and invite them to share their experiences with us. For my part I would be willing to set up meetings with my colleagues at Bell Communications Research in Morristown, NJ, who are active in networking issues. I would also be glad to give a tour and demonstration of our research network facilities (based on TCP/IP with connectivity to the ARPA Internet). With enough advance notice, I could also make the arrangements for a Digital Committee meeting to be held out-of-hours in one of our conference rooms.

73,

Phil Karn, KA9Q

C2974 CC84 Lyle Johnson (WA7GXD,2973) 9/ 8/85 1:08 AM L:109
KEYS:/NETWROKING CONTROLLER UPDATE/

Network Node Controller (NNC) Update
To keep everyone in the loop, here is the present status of the TAPR NNC hardware project.
The schematics are presently in St. Louis at Interconnections, the company that does all the CAD layout work for TAPR. If all goes well, we should have artwork for all three boards by the end of the month!
Three boards???
Board 1 is the NNC itself. Its present configuration is as follows:
1)HD64180 processor. This is the Z80 superset chip with on-chip DMA, CMOS, dual UARTs, 16 bit timers, MMU, clock, etc. Same as featured in September BYTE SB180 project.
2)Dual SIO/2s. This allows four channels of HDLC capability. One SIO may be configured (via push-on jumpers) to have channel A and/or channel B operate DMA.
3)One PIO. This gives a parallel printer port and several lines to fiddle with (for Bells, Whistles, Buzzers and...)
4)...a battery-backed Real Time Clock. The chip in the first cut is the Mostek 3835. Serial interface (via PIO), 8-pin miniDIP, etc. App note enroute from Mostek on ways to reduce current drain from 600 uA.
5)NCR 5380 SCSI interface. This chip may be configured to operate under DMA. Allows this board to be a smart Level Two "front end" for a later board that can handle all the networking, transport and etc when the network outgrows the capacity of the 64180. Also allows multiple 64180s to talk, etc.
6)Eight byte-wide sockets, battery backed, for 6264Ls (allows 64k bytes of bbRAM) with jumper selection for 43256Ls (allows 256k bytes of bbRAM !!).
7)Eight more bytewide sockets mapped for 32k byte parts. Jumper selectable for 27C256s or 43256s. Can use 6264s as well. This allows the full 1/2 megabyte to be put on the board.
8)Expansion interface for Board Three (described below).
This will run on 5-volts DC, has RS-232 compatible ports for the two async UART channels that are part of the 64180. The serial interface is per the WESTLINK paper, with the two unused pins going to the DTR and DCD pins of the SIO/2. TTL levels.
But, you may ask, what good is a NNC without modems?
Glad you asked that!
Board Two, to go to St. Louis next week (to give them a reason to not get at Board Three, which is already there) consists of:
1)Multiple XR2206/XR2211 modems. Clock generator and a separate state machine provided for each modem as well as a tuning indicator. Board constraints will determine whether we only get two modems or if we can squeeze four modems per card.
B)Yes these are only 1200 baud (or 300 baud) modems. But, the local users need a port or two to get in (1200 baud) and long-haul stuff is going to be HF for a while to come (300 baud now, 1200 later?).
Both of these boards to be sized per the WESTLINK paper so they can screw on the side of a 5.25" floppy drive.
Why a floppy drive?

Glad you asked that!

Board Three is a plug-in floppy disk interface! (Here is an implementation of your iSBX comment, Pat.) The I/O is mapped to be compatible with the SB180 to allow a simple port of the "Z" system. Thus, the NNC can become its own software development engine. And, the hard work of the port of a decent (?) operating system is already done and readily available at a reasonable price.

If we are lucky, all boards will be laid out by the end of September. Prototype boards should be populated in October, then debugged by hardware types while the software types (hopefully) will get cranking on some level three stuff.

We're cooking with gas now!

Thank you each and every one for your inputs to date. Keep the comments coming!

Who knows, we may be able to get a December release on these things so all you Networking development types can cranking on some decent, available and CHEAP! hardware in time for Christmas (or Hanukah, as you prefer).

PS - the K9NG modem boards were ready today at the PC house. The hard-to-get capacitors are nearly all in. Jeff Ward and Jon Bloom of the ARRL have really helped a lot on this project, building on the layout done by Chuck Green. The board will have good documentation as a result. It will be supplied with the above-mentioned capacitors and a programmed State Machine EPROM. Expect an announcement on DRNET later in the week for price and availability. Target price is around $20. 100 boards in the first lot.

Happy Packeting!

Lyle

Documents
CCIR Study Groups
Period 1982-1986

Document 8/303-E
7 June 1985
Original: English

Received: 5 June 1985

Subject : Report 905
Question 48-1/8

Note to Digital Committee: The number of 2000 given below is not representative of the quantity of TNC/PADs out there now; more like 6000, anyway now. Also, not a very warming description of packet radio in para 3. When I get a chance, I'll try to feed some better information to the U.S. reps of CCIR Working Group 8. Paul
W4RI

Canada

PROPOSED MODIFICATION TO REPORT 905

TECHNICAL INVESTIGATIONS IN THE AMATEUR SERVICE

1. Introduction

The paragraphs relating to "bandwidth compression" and "computer communications" need to be brought up to date.

2. Bandwidth compression

The frequency companding feature of the NBVM (narrow-band voice modulation) system is no longer under intensive development in the amateur service. The emphasis is now on amplitude companding and this is being developed in commercial service, hence section 2.2, Bandwidth compression, can be removed in its entirety from Report 905.

3. Computer communications

There are many packet radio networks in the amateur service in several countries, with more than 2000 amateur stations equipped for the mode. Intensive work is under way on protocols for presentation, network and transport levels, and there is experimentation and development of inexpensive Packet Assembler/Disassemblers and modems. The text in the annex is proposed to replace that presently in Section 2.5 of Report 905, together with the indicated changes in the References to the Report.

4. Proposal

It is proposed that Report 905 be modified as shown in the annex.
Annex: Technical investigations in the amateur service.

ANNEX

TECHNICAL INVESTIGATIONS IN THE AMATEUR SERVICE

The following changes are proposed for Report 905:

2.2 Bandwith compression
Delete the entire section 2.2

2.5 Computer communications

Revise the existing text as follows:
The advent of personal microcomputers has resulted in extensive experimentation with computers by private individuals, including some in the amateur service. There is a trend towards merging these two experimental areas. One example is a type of packet radio technology that employs a host computer with multiple users. Amateur technical investigations are underway ~~in Canada (Hodgson, 1979)~~ in several countries (ARRL, 1983, 1984, 1985), generating improved protocols at all layers of the ISO Open System Interconnection reference model. Work is also being done on the development of inexpensive Packet Assembler/Disassemblers and modems. ~~Useful information can be expected to emerge, for example, about frequency sharing between packet radio systems and between packet radio users and others employing more conventional methods.~~

In the Reference to the Report, (page 803 of the Green Book Vol VIII):

a) Delete HODGSON. I. (June 1979);

b) Add ARRL (March, 1983, 1984, 1985, 1st, 2nd, 3rd and 4th ARRL Amateur Radio Computer Networking Conference. ARRL, Newington CT 06111

USAコンフィデンシャル

N9EHU es JE1HYR 井端 一雅

パケット通信用 TNC その後

昨年11月号のこのページで，パケット通信について紹介しました．その後，パケット通信に必要なTNC（ターミナル・ノード・コントローラー）が，日本でも入手できるようになったと聞いています．

最近，W では，TNC の標準ともいえる TAPR（ツーソン・アマチュア・ハケット・ラジオ）の，TNC 1 の同等品が，AEA 社（PKT-1 589.95ドル），Kantronics 社（Packet Communicator 389.95ドル），Heath Kit 社（HD4040／299.95ドル）などから発売されています．これらは，いずれも TAPR の TNC 1 と基本的に，まったく同じ回路を使用しています．

一方，TAPR のほうでは，今後 TNC 1 の製造は中止すると発表しています．そして，新しく TNC 2 を，この夏以降より市場供給するといっています．

TNC 2 は，今までの TNC 1 に比べて，一回り小さくなります．CPU も，今までの6809から Z80に変更され，ソフトウェアーも，ハンドで書かれていたものから，アセンブラーに変更されるそうです．これは，かなりの変更ですから，場合によっては TNC 2 の初期バージョンには，バグが残ることも覚悟しておく必要があるでしょう．

これから，ハケット通信を始める人にとっては，商業ベースに乗った，実績ある TNC 1 を選ぶか，ハケット通信の最新技術アップ・デートが今後も期待できる TNC 2 を選ぶか，選択をせまられることになるようです．

ドレーク No Longer

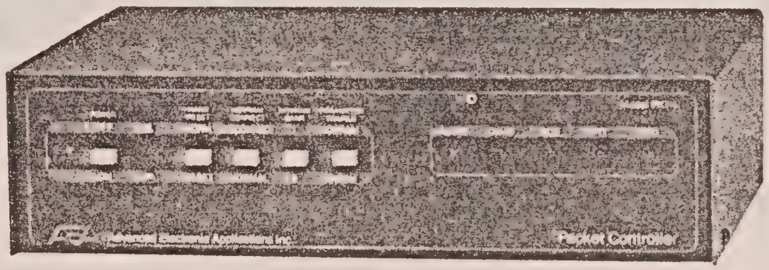
73誌5月号の「QRX」(担当 KW1O）によりますと，あの R.L. DRAKE 社は，今後アマチュア無線機器の製造を行わないと発表したそうです．

ドレークといえば，昔は「プアマンズ・コリンズ（貧乏人向きコリンズ)」と悪口をいわれながらも，4ラインや TR 7などの名機を作っていた会社で，日本でもマニアは多かったと思います．最近では，衛星テレビ受信用の装置などの宣伝を，ときたま見かける程度でした．

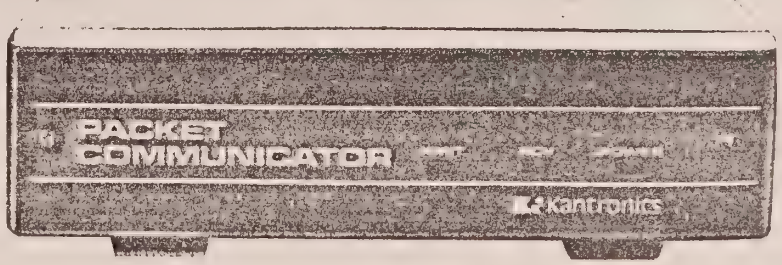
もちろん，ドレークはアマチュア無線機器の製造を中止したとはいえ，今までのリグのサービスについては，各製品の特殊部品が入手不能になるまで，あるいは修理費が，製品の価段以上になるまでは，引き続き行うといっています．

ドレークを持っている人で，リグのサービスについて心配な人は，同社まで問い合わせてみるとよいでしょう．

R.L.Drake
540 Richard Street.



TNC 1の同等品，AEA 社の "PKT-1"



同じく Kantronics 社の "Packet Communicator"

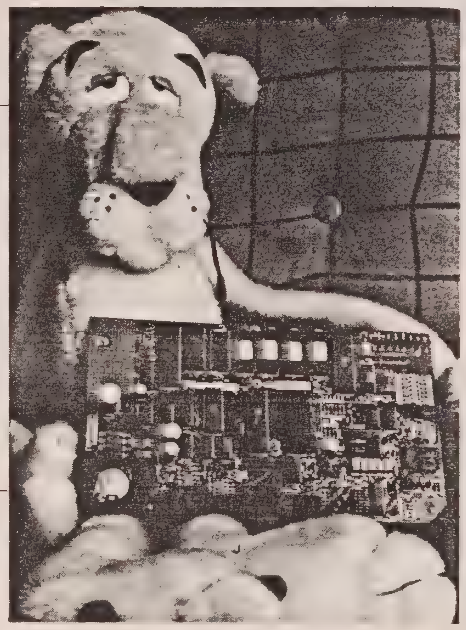
そして TNC の新商品 "TNC 2"

データ通信用インターフェース・キットに挑戦

つくる"TNC"

"Terminal Node Controller"
はアメリカのアマチュアにより開発されたデータ通信用インターフェース，完成度には定評のあるこのキットの製作を，注意点などまじえて誌上再現してみました．

JR1ING 菊川 要一



ハムの世界に限ったことではありませんが，新しい世界が開けようとする時代には，必ず"名機"と呼ばれるキットがあったように思います．古くは9R59D，マイコンのTK80，SSTVスキャン・コンバーター，さらにGHzトランスバーター…といえば，胸をときめかせて製作された思い出をお持ちの方も少なくないのではないでしょうか．

さて，これから紹介するのはアリゾナ州ツーソンのアマチュアの手による，データ通信用インターフェース，TAPR*-TNC（キット，250＄）の製作記です．最初におことわりしておきますが，残念なことに，本機の多くの機能は，ボード上のROMにファームウェアの形で乗っています．したがって，ハードの組み立てについての説明は，このキットのほんの一面について紹介することにすぎません．

しかしながら，このキットを作った多くのアマチュアは共通して，キットの完成度について高い評価を下していることも事実です．これは，このキットが，いままでの各種のキットに見られない，作りやすさに対する数多くの工夫がなされているからだと思います．ここではそれらを中心に，製作工程を順を追って説明します．これから，個人やクラブでキットを頒布したり，製作したりする方の参考にもなるのではないかと思います．

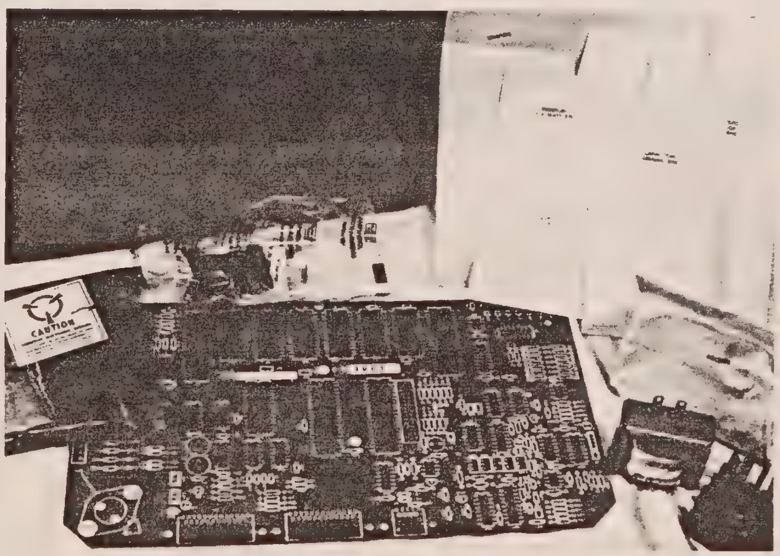


写真1　梱包をほどき，仕分けをして欠品がないかどうかをチェック

[illegible]

約110種類の部品で構成されています．これらをICソケット，*CR*，ダイオード，ICなどに分類し，それぞれ欠品がないかどうかチェックします（**写真1**）．

抵抗やコンデンサーは，あらかじめ小さい袋に分けられていますので，これと，マニュアルのリストを照合します．

全部の部品についてチェックすると，かなり時間がかかりますが，少なくとも国内で入手しにくいいくつかのICについては，欠品がないことを確認しておいたほうがよいでしょう．

私の作った2台のTNCについていえば，欠品は皆無でした．なお，分類した部品は，それぞれ小さく区切られた容器（たとえば卵ケース）に入れておくと，作業がしやすい——とマニュアルに書かれていました．

[illegible]

8～40ピンのICソケットを，ボード上の印刷にしたがってハンダ付けします．私の場合，キットに含まれていたICソケットを使

〒168 東京都杉並区浜田山4-27-18

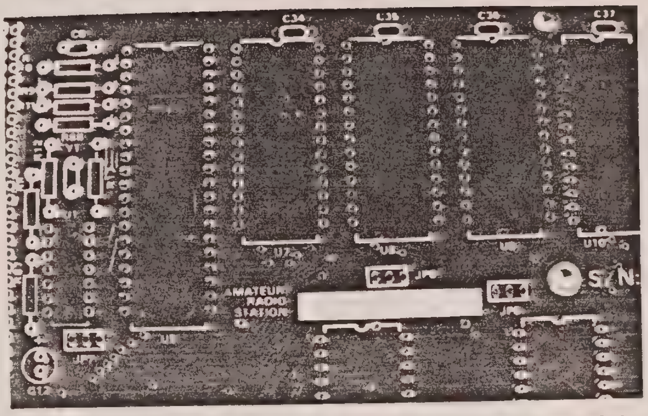


写真2　ICソケットの取り付け．筆者は金コンタクトの手持ちを使用した

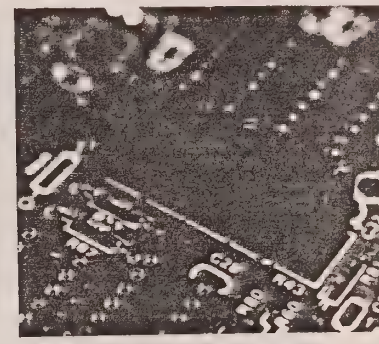


写真3　$R_{31,33,36,38,43}$のポテンショは，回転部が右上にくるように

わず，金コンタクトの手持ちのソケットを使用しました（**写真2**）．

ソケットは角のピンからハンダ付けし，基板から浮いていないことを確認してから全部のピンをハンダ付けします．後からどうもデコボコだ，と気がついても直すのはたいへんです（経験者は語る）．

スルー・ホールへのハンダの乗りは非常にFBです．両面ソルダー・レジストのため，ハンダ・ブリッジの心配はほとんどありませんが，一応，気をつけます．

ロジック系のパスコン，電源系のケミコン，およびそのほかのコンデンサーに分けられます．このうち，パスコンとして，単板のセラミック・コンデンサーが付属していましたが，私は手持ちの積層セラミック（0.1μF）を使いました．

コンデンサーの中には，同じ大きさでも容量の異なるものがあるので気をつけます．また，リードの幅とボード上の穴間隔が合わないものがあるので，先にリードを折り曲げ加工しておくとよいでしょう．

抵抗値と番号（例R_{10}）を，マニュアル上で確認しながら，抵抗のハンダ付けをします．マニュアルには，抵抗値とカラー・コード（red, green……）が1本ごとに記載されています．つまり，このキットを作る限りにおいては，カラー・コードを覚えたり，換算したりする必要はまったくないわけです．

また，ボード上の抵抗記号もはっきりしており，よくありがちな，三つ以上のスルー・ホールにまたがる印刷（どの穴に通すのかわかりにくい）もありませんでした．

$R_{31,33,36,38,43}$の五つのポテンショ（FSKの周波数レベル調整用）は，回転部分が右上にくるようにします（**写真3**）．

LEDと整流（検波）用のダイオードを，所定の位置にハンダ付けします．これも方向だけに気をつければよく，シルク印刷にしたがってハンダ付けすれば完了です．

ここまでくると，ボード上がだいぶにぎやかになってきたように感じます（**写真4**）．

7.3MHzのクリスタル，ジャンパー・ストリップ，ディップ・スイッチ，電源レギュレーター，コネクターなど，残っている部品を取り付けます．

ハンダ付けが終わったジャンパー・ストリップには，ジャンパー・ピンを挿入します．位置はマニュアルどおりでよいのですが，ジャックJ_5のジャンパーは，外れやすいので注意します（ボードのまま持ち歩くと必ず紛失する！@90円）（**写真5**）．

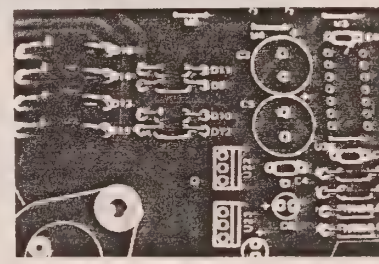


写真4　LEDと整流用ダイオードを取り付ける．方向には気をつけて

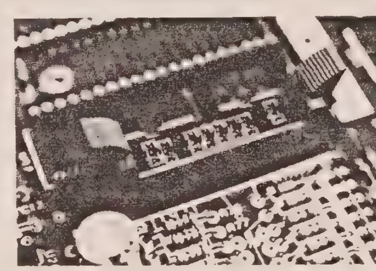


写真5　ジャックJ_5のジャンパー．外れやすいので注意して取り扱おう

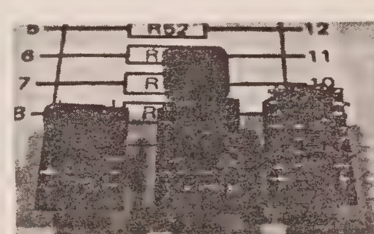


写真6　フィルターを構成するCR．まとめてディップ・ヘッダーにハンダ付けしてからICソケットに挿入

また，D-SUB25ピン・コネクターは，後ろから見て左側が穴のあるほう，右側がピンの出ているほうが正しいので，逆にしないようにします．

ディップ・スイッチは，マニュアルにしたがって初期状態にセッ

＊Tucson Amateur Packet Radio
P.O. Box22888 Tucson, Arizona 85734

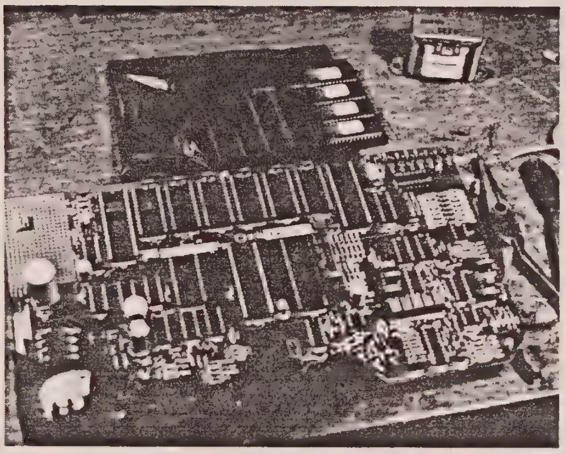


写真7　ICの取り付けはピンを確認して差し込む

写真9　筆者はターミナルにAppleIIを使用した

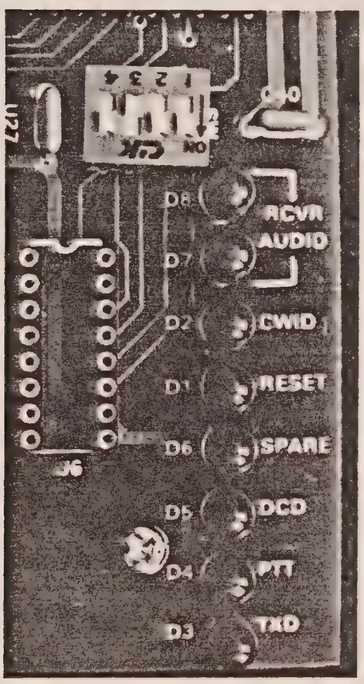


写真8　LEDの点灯をチェックする

トします（SW_3のみOFF）.

[illegible]

フィルターを構成する*CR*などは，後あとの定数変更が容易なように，何本かまとめてディップ・ヘッダーにハンダ付けしてからICソケットに挿入する，という取り付けかたをしています（グッド・アイデア！）（**写真6**）.

[illegible]

キットは，AC100V（100〜125V）の電源を含んでいます．ロジック系・アナログ系の各電圧は，ボード上のいくつかのシリーズ・レギュレーターで供給しています．

電源部は，外付けのトランスと，ボードの電源コネクターの間の配線だけで完成します．ただし，ここで間違えるとキットがだいなしですから，少なくともこの工程だけは，マニュアルにチェックを付けながら，慎重に進めるのがよいと思います．

次に，実際に電源を入れ，各部の電圧をチェックします．マニュアルに指示された位置（ICソケットのピン）の全部が規定の電圧であることを，テスターで確認します．

ここまでがOKならば，いったん電源を切り，ICの型名とボード上の位置（例U_{10}）をマニュアルで確かめながら，全ICをソケットに差します．このキットではすべてのICの1ピンがボード左上方向にくるように統一されているので，方向を間違える心配は少ないでしょう（**写真7**）.

次に，ICを含めての動作テストです．LEDに注目しながら，電源を再度投入します．するとまず，LEDのD_1（RESET），D_6（SPARE）が点灯し，1〜2秒後にD_2（CWID）が点灯するはずです．これらのLEDは実際の運用上，表示器として動作するだけでなく，テストやキャリブレーションのときにも利用されます（**写真8**）.

[illegible]

まず，ターミナル（パソコン）とTNCをつなぐケーブルを作ります．これはどこにでもあるRS232Cのケーブルでよく，音響カップラーなどとつなぐためのケーブルがあればそのまま使えます（1〜8，20ピンどうしが接続されていて，両端にDB25Pメール・コネクターが付いていること）.

次に，ターミナルの設定を行います．通信仕様は次のとおりです．

> 300ボー，7ビット（パリティ・スペース）または8ビット（パリティなし），ストップ・ビット1

筆者は，**写真9**に示すように，AppleIIにAppleスーパー・シリアル・カード，通信用ソフト“ASCII Express”の組み合わせを使っていますが，現行のほとんどのパソコンもこの232Cの通信仕様を満足しているはずです．

[illegible]

このTNCは，ターミナルとの通信速度を自動的に検知し，セットするという面白い機能を持っています．ターミナルとTNCを接続し，ターミナル→TNCの順に電源を投入すると，ターミナルに**第1図**のメッセージが現れます．ここで1〜2回“*”（アステリ

TNCについては，p.392「USAコンフィデンシャル」も併わせてご覧ください．

第1図　ターミナルに現れるメッセージ

```
Please type an asterisk ( * ) for autobaud routine
```

第2図　キーを2度ほどたたくと次のメッセージが現れる

```
Tucson Amateur Packet Radio Corporation
TAPR/AMSAT AX.25 level 2 version X.Y
RAM length is 2000
cmd:
```

第3図　メニュー表示

```
Menu:
    1  Set low tone (1200 hz) - 1st pot
    2  Set high tone (2200 hz) - 2nd pot
    3  Set demodulator (1700 hz) - 5th pot
    4  Set audio level - 4th pot
       and tone null - 3rd pot
    5  ROM checksum
    6  End calibration and reset

 cal:
```

スク）のキーをたたくと，第2図のメッセージが出てきます．

今回は，最初にターミナルを300ボーにセットしてあったためこうなりましたが，ターミナルがたとえ9,600ボーであっても，アステリスクをキー・インすると，以後はその速度で通信できるようになります．

もちろん，通信速度などの各パラメーターは，ボード上の不揮発性RAMに，半永久的に記憶させておけますから，スイッチを入れるたびにこうやって速度を合わせる必要はまったくありません．

[illegible]

ＦＳＫモデムのトーン周波数や，デモジュレーターの調整は，特別な測定器は必要なく，ターミナルとボード上のＬＥＤを見ながら，ポテンショで規定の周波数にセットできるようになっています（写真10）．

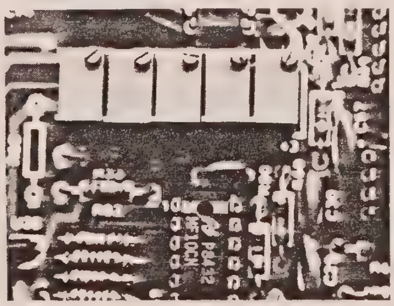


写真10　トーン周波数やデモジュレーターの調整は，ＬＥＤを見ながらこのポテンショで調整する

ターミナルからキャリブレーション・コマンドを入力すると，ＣＲＴには第3図のような，メニューが表示されます．後は，メニューにしたがって，ボード上のジャンパー・ピンをセットし，二つのＬＥＤ（D_1，D_2）が片方だけでなく，両方が点灯（点滅）するようにポテンショを調整すればＯＫです．

念のため，周波数カウンターでトーン周波数を測定してみましたが，いずれもずれは数Hz以内におさまっていました．

これで，このキットは完成です．最後に本機と送受信機をつなぐケーブル（ＭＩＣ，ＰＴＴライン）を作ります．マニュアルには，市販のトランシーバー約20機種との接続例が紹介されています．実際には，一機種だけでなく，いろいろなトランシーバーと接続するチャンスも多いと思いますので，ＴＮＣ側のコネクター（ＤＥ９Ｐ）をいくつか用意し，機種ごとのケーブルを作っておくとよいでしょう（相手は思いがけないバンドで突然見つかるものです！）．

＊　＊　＊

完成したＴＮＣを，どのようなケースに入れようかと考えるのもキットの楽しみです（実はＴＡＰＲ製のケースもあるのですが…）．筆者は，アルミ・ケース(タカチ電機SL -14Ｓ／49×320×230㎜)を使いました．これ以上小さいケースでは少々無理があるかと思います．

また，モデムを外に出す場合，もう少し高さの高いケースがよいと思います．

◈参考文献◈

・TUCSON AMATEUR PACKET RADIO CORPORATION. Packet Radio Terminal Node Controller Rev. 3　SYSTEM MANUAL

ディジタル通信と混信

新しい通信方式が登場すると，混信の問題が生ずることがあります．古くはAMとＳＳＢ，そしてCWとＲＴＴＹなどが過去に例としてありました．そして，ディジタル通信も，例外というわけにはいかないのでしょう．

混信問題を解決する基本は，お互いに理解し合い，ゆずり合う精神ですが，新しいモードは手軽に復調しにくいことが，相互に理解し合うことのさまたげになりやすいともいえます．

ちなみに，国状は違いますが，ディジタル通信愛好家がいるアメリカでは，144MHz帯がディジタル通信によく利用されています．そのアメリカで，以前は146MHz台など高い周波数帯（アメリカではアマチュア・バンド内）が利用されていたものが，ＦＭとの混信を避けて現在では144.01/03/05/07/09MHzなどの低い周波数帯を利用しているといわれています．(編)

＊ＴＡＰＲからＴＮＣ２が新しく発表になりました．関連記事 p.392

Documents
CCIR Study Groups
Period 1982-1986

Document 8/342-E
2 July 1985
Original: Russian

Subject: Report 909

USSR

DRAFT ADDITIONS TO REPORT 909

TECHNICAL CHARACTERISTICS FOR MARITIME RADIO EQUIPMENT USING NARROW-BAND PHASE-SHIFT KEYING (NBPSK) TELEGRAPHY

(Question 54/8)

Introduction

Narrow-band phase-shift keying (NBPSK) telegraphy can be successfully introduced into the maritime mobile service if it is possible to:

1) use ship and coast station channel forming equipment (radio transmitter, radio receiver);

2) retain existing frequency assignments in the narrow-band direct printing bands;

3) use simple modulators and modems.

In this connection it is important to examine the following questions: the formation and demodulation of NBPSK signals; the use of NBPSK in conjunction with frequency-shift keying; the arrangement of NBPSK channels in the maritime mobile service narrow-band telegraphy channels; the technical characteristics of modulators and modems for use with radio transmitting and receiving equipment.

In addition, it is necessary to study the influence of channels on one another when radio transmitters are in different geographical locations, and also the question of noise immunity at transmission speeds of 200 bauds with NBPSK.

For these reasons, it is proposed to make the following additions to Report 909:

1. Insert the following new §§ 3, 3.1, 3.2, 3.3, 3.4 and 3.5 in the report:

"3. Methods for introducing narrow-band phase-shift keying (NBPSK) telegraphy in the maritime mobile service

3.1 The formation of NBPSK signals

NBPSK signals can be produced either by analogue or by digital methods. The basic element in forming NBPSK signals is the filtering of a keyed sequence or a PSK signal at a sub-audio frequency (Figure 12 a) b)).

In the case of a keyed sequence, the recoded keyed signal passes through low-frequency filter which has a cut-off frequency of 0.55 Bmax (Bmax being the maximum telegraph speed in the radio channel).

After passing through the low-frequency filter, the keyed signal, rounded by filtering, enters a phase modulator. The signal is modulated at a sub-audio frequency in the audio-frequency band (normally 1.5 - 1.7 kHz) or in a higher frequency band (100 kHz and higher).

The advantage of the keyed sequence filtering method is that the low-frequency filter circuit is relatively easy to set up (use could be made of specialized filters with operational amplifiers). A disadvantage is that the phase modulator has to meet stringent requirements.

The phase modulator has to be highly efficient in suppressing the even output signal spectral components.

In the case of PSK signal filtering, the keyed sequence is fed to a phase-shift keyer. The phases are keyed at a sub-audio frequency in the audio band or in a higher band. After passing through the phase-shift keyer, the signal is fed to a band-pass filter with a passband of 1.1 Bmax.

The advantage of the sub-audio frequency filtering method is that the phase-shift keyer circuit can be very simple, for example, it can be made of OR-AND logic elements. The disadvantage is that it is somewhat complicated to make the NBPSK signal shaping filters. The higher the sub-audio frequency, the more complicated is the filter structure.

The amplitude frequency response of the NBPSK shaping filter is shown in Figure 13.

3.2 Demodulating NBPSK signals

For demodulating the NBPSK signals, the same methods are used as in demodulating PSK signals. The most commonly used methods are phase comparison and polarity comparison. Both methods are identical from the point of view of the complexity of the equipment to be set up but the phase comparison method offers greater noise immunity in the reception of NBPSK signals.

In recent years widespread use has been made of digital signal demodulation methods in radio receivers. As there is no practical difference from the point of view of constructing digital demodulator circuits for NBPSK and FSK signals, it is possible, when designing digital FSK signal demodulators, to make provision for NBPSK signal detection functions.

3.3 Combined use of NBPSK and FSK and arrangement of NBPSK channels in maritime mobile service narrow-band telegraphy channels

The use of NBPSK in narrow-band telegraph channels is not at variance with, and does not alter, the organizational structure of the communications system between ships and coast stations.

To ensure the effective use of narrow-band direct printing channels in the maritime mobile service, the arrangement of NBPSK channels must be organized in such a way as not to interfere with the existing allocation of frequencies and also as to

enable radio transmitters and receivers to tune in to any of the NBPSK channels. Since the minimum tuning step of modern radio receivers is 10 Hz, NBPSK channel spacing must be a multiple of 10 Hz. The assigned frequencies of narrow-band direct printing channels have a separation of 500 Hz. With a radio channel operating at a speed of 100 bauds, the control emission band (reading level - 30 dB) does not exceed 260 Hz.

There are therefore two possibilities for the arrangement of NBPSK channels in the existing narrow-band telegraphy channels:

- ensuring minimum interference in adjacent narrow-band telegraphy channels;

- ensuring maximum efficiency in the use of the frequency spectrum.

In the first case the centre frequency of the NBPSK signal corresponds to the assigned frequency so that one NBPSK channel can be accommodated in one narrow-band telegraphy channel.

With this method of using narrow-band telegraphy channels, it is possible to eliminate the influence of strong interference from adjacent channels since the bandwidth of the radio receiver filter in the NBPSK mode is much narrower than in the FSK mode.

In the second case two NBPSK channels are accommodated in one narrow-band telegraph channel, and the maximum telegraph speed in each NBPSK channel is 100 bauds.

In this case each NBPSK channel can be assigned 250 Hz. If the assigned frequency of the NBPSK channels is located 125 Hz on either side of the assigned frequency of the narrow-band telegraphy channel, the nominal assigned frequencies of the NBPSK channels will be multiples of 5 Hz. This would make it impossible for radio receivers with a tuning step of 10 Hz to receive NBPSK signals.

To ensure the compatibility of NBPSK signals with receivers having a tuning step of 10 Hz, the assigned frequencies of the NBPSK channels must be located not 125 but 130 Hz on either side of the assigned frequency of the narrow-band telegraph channel. The out-of-band spectral components will then be negligible and it will be possible for NBPSK signals to be received by receivers with a tuning step of 10 Hz.

With a telegraph speed of 200 bauds, the assigned frequency of the NBPSK channel coincides with the assigned frequency of the narrow-band telegraph channel.

3.4 <u>The use of existing maritime radio equipment for the organization of NBPSK channels</u>

Given the characteristics of modern ship and coast radio transmitters and receivers (frequency stability, amplification linearity of the information signal circuits of radio transmitters, group delay uniformity of selective circuits), it is possible for such equipment to operate normally in NBPSK channels. Ship radio transmitters of the type "Brig", "Korvet", "Bark" have NBPSK signal forming units and a telegraph speed in the radio channel of 100 bauds is possible.

Ship radio receivers "Sibir" and "Tsikloida" can receive signals in the NBPSK mode with a maximum telegraph speed in the radio channel of 100 bauds.

3.5 Requirements for modulators and modems operating in the NBPSK mode

Maximum effectiveness can be expected from the introduction of the NBPSK mode if use is made of specialized modulators or modems. These devices can be designed as an integral part of the reliability enhancement equipment.

Modulator. Since series-produced radio receivers like "Sibir" and "Tsikloida" can be used for reception in the phase-shift keying mode and can be designed with a tuning step of 10 Hz, there is no difficulty about arranging for two channel receive operation. The transmitters presently in use can be used only for single channel operation because they have a tuning step of 100 Hz.

To provide for two channel transmit operation, use must be made of a two channel modulator capable of producing two PSK sub-audio output signals.

The structure of the modulator circuit is shown in Figure 14. The modulator has two inputs. The keyed sequence input signals pass through two phase-shift keyers, one of which operates at 1 570 and 1 830 Hz. The signals are processed by a very simple frequency synthesizer consisting of a reference generator, frequency dividers and adders. The PSK output signals from the phase-shift keyers then go to the NBPSK signal forming filters.

The tuning frequency of the filter of the first channel is 1 570 Hz and that of the second channel is 1 830 Hz. The passband is 110 Hz. After passing through the filters the formed NBPSK signals go to the adder.

On board ship the keyers are used as follows, depending on the channel being used. The direct printing equipment is switched to input 1 or 2. Sub-audio frequency signals at 1 570 Hz are sent to the transmitter input for operation in the first channel or at 1 830 Hz for operation in the second channel. The ship's transmitter operates using class of emission F2B.

The coast station has the possibility of using a coast radio transmitter and a transmitting antenna system for simultaneous operation with two ships.

For this purpose two sets of direct printing equipment are connected to the keyer: one to input 1 and the other to input 2. At its output the keyer produces a compound signal made up of two sub-audio frequency signals at 1 570 Hz and 1 830 Hz, each sub-audio frequency signal being phase-shift keyed. The coast transmitter operates using class of emission F7B.

Modem. The use of a two-channel modem significantly improves the efficiency of the communication channel.

The main functions of the transmitting part of the modem are as follows:

- formation of phase-shift keyed signals at 1 570 and 1 830 Hz, telegraph speed 100 bauds;
- formation of phase-shift keyed signals at 1 700 Hz, telegraph speed 200 bauds.

The main functions of the receiving part of the modem are as follows:

- reception of NBPSK signals at 1 700 Hz at a telegraph speed of 200 bauds;

- operation on one of the sub-audio frequencies 1 570, 1 830 or 1 700 Hz;

- reception of information on two channels at sub-audio frequencies 1 570 and 1 830 Hz;

- linear addition for automatic selection of signals at sub-audio frequencies 1 570 and 1 830 Hz."

2. §§ 3, 3.1, 3.2, 3.3 and 3.4 should be renumbered 4, 4.1, 4.2, 4.3 and 4.4.

3. §§ 4, 4.1, 4.2, 4.3 and 4.4 should be renumbered 5, 5.1, 5.2, 5.3 and 5.4.

4. §§ 5, 5.1, 5.2 and 5.3 should be renumbered 6, 6.1, 6.2 and 6.3 and the following text should be added to the new § 6.3:

"The influence of two NBPSK channels with a space diversity of 2,010 km for the transmitters of each channel was studied on links between Leningrad and the Mediterranean and Yalta and the Mediterranean, with simultaneous reception of the text by the motor ship "Geroi Panfilovtsy".

With a sample size of 400,000 bit/s, $\eta' = 1.08 \pm 0.12$ for the Yalta - Mediterranean link and $\eta' = 1.2 \pm 0.08$ for the Leningrad - Mediterranean circuit. The confidence coefficient was 95%.

The condition of the channel was characterized by a received character error probability of $6.10^{-2} - 5.10^{-3}$."

5. Insert the following new §§ 7, 7.1 and 7.2:

"7. <u>Ship tests with a maximum transmission speed of 200 bauds</u>

In view of the need to ensure maximum information transmitting speed in the radio channel, comparative tests of NBPSK systems with transmission speeds of 200 and 100 bauds were carried out with a view to determining the error probability.

7.1 <u>Test conditions</u>

The tests were carried out in 1985 on the motor ship "Geroi Panfilovtsy" in the Mediterranean, the Atlantic and the Indian Ocean. The ship station was located at Yalta. The length of the radio link varied from 0.5 to 7 thousand km. Use was made of the maritime mobile service frequencies in the 4, 6, 8, 12, 16 and 22 MHz bands. Radio channel information was transmitted by means of 7-unit code with constant weight. The signal forming algorithm for transmission and processing at reception was in line with CCIR Recommendation 476-3 for direct printing equipment operating in the FEC mode. The passband of the receiver's basic selectivity filters was 110 Hz for a transmission speed in the radio channel of 100 bauds and 210 Hz for a transmission speed in the radio channel of 200 bauds.

The text, which was repeated 24 times, consisted of the standard phrase "The quick brown fox jumps over the lazy dog 1234567890+" for a transmission speed in the radio channel of 100 bauds and was repeated 48 times for the 200 baud transmission speed.

The transmission was carried out in line with the following sequence: 4 minutes test signal at a keying speed of 200 bauds at the assigned frequency, 1 minute pause, 4 minutes at a keying speed of 100 bauds at 130 Hz below the assigned frequency, 1 minute pause, 4 minutes at a keying speed of 100 bauds at 130 Hz higher than the assigned frequency, 1 minute pause, etc. For comparison purposes, a 4 minute interval was added to each sequence for the transmission of information in the frequency shift telegraphy mode at a keying speed in the radio channel of 100 bauds.

7.2 Test results

Altogether 215 test sessions were carried out in the FEC mode. Each test session lasted about 4 minutes. Table X gives data on the various sessions, the number of characters transmitted, the distances between ship and station and the mean error probabilities. The table also gives information on detected and non-detected errors.

As can be seen from Table X, when the channel is in good condition ($P_{m\ FSK} = 2 \cdot 10^{-2}$ per character), for NBPSK 200 bauds, $P_{m\ NBPSK\ 200} = 2.5 \cdot 10^{-2}$, and for NBPSK 100 bauds, $P_{m\ NBPSK\ 100} = 1.5 \cdot 10^{-2}$.

When the channel is in bad condition ($P_{m\ FSK} = 3 \cdot 10^{-1}$ per character), for NBPSK 200 bauds, $P_{m\ NBPSK\ 200} = 6.5 \cdot 10^{-1}$, and for NBPSK 100 bauds, $P_{m\ NBPSK\ 100} = 1.2 \cdot 10^{-1}$.

The mean error probability $P_{m\ NBPSK\ 100}$ was determined as the mean arithmetic error probability for an NBPSK channel 130 Hz lower than the assigned frequency and for an NBPSK channel 130 Hz higher than the assigned frequency.

Figure 15 shows the integral error probability distribution curves for NBPSK 200 bauds, NBPSK 100 bauds and FSK 100 bauds."

6. § 6 should be renumbered 8 and rewritten as follows:

"8. Conclusions

8.1 The permissible filtering limit for an NBPSK signal is $\Delta FT = 1.1$. In a channel with Rayleigh fading, NBPSK noise immunity is superior to that of FSK with a bit error probability of $P \geqslant 2 \cdot 10^{-3}$.

8.2 The occupied bandwidth for NBPSK signals is 2.5 times less than for FSK.

8.3 To suppress the out-of-band NBPSK spectral components, the transmitting equipment must have a highly linear amplitude characteristic. The SSB ship transmitters presently in use meet the linearity requirements.

8.4 The bandwidth of out-of-band spectral components at levels 30, 40, 50 and 60 dB for NBPSK is half that for FSK.

8.5 NBPSK has a lower error probability than FSK.

The gain ξ in the mean error probability for NBPSK in comparison with FSK ranges between a factor of 2 and 6, the greatest gain corresponding to the worst channel.

8.6 The synchronization time for direct printing equipment in the A system (ARQ) for NBPSK is about one half to one quarter of the synchronization time for FSK.

8.7 For telegraph speeds in the radio channel of 200 bauds, the NBPSK channel can be accommodated in the maritime mobile service narrow-band direct printing channel. The centre frequency of the NBPSK signal then corresponds to the assigned frequency and the inter-channel interference level does not exceed the levels produced by class FIB emissions.

8.8 Two independent NBPSK sub-channels can be accommodated in one narrow-band direct printing channel. The telegraph speed in each sub-channel is 100 bauds. The centre frequency of one sub-channel is 130 Hz lower than the assigned frequency and the centre frequency of the second is 130 Hz higher than the assigned frequency of the narrow-band direct printing channel. No mutual interference between the channels is observed either for one transmitter location or for various transmitter locations.

8.9 Ship station SSB equipment is suitable for the organization of NBPSK channels. For equipment not designed for NBPSK, the use of modems with voice frequencies 1 570, 1 700 and 1 830 Hz is recommended."

TABLE X

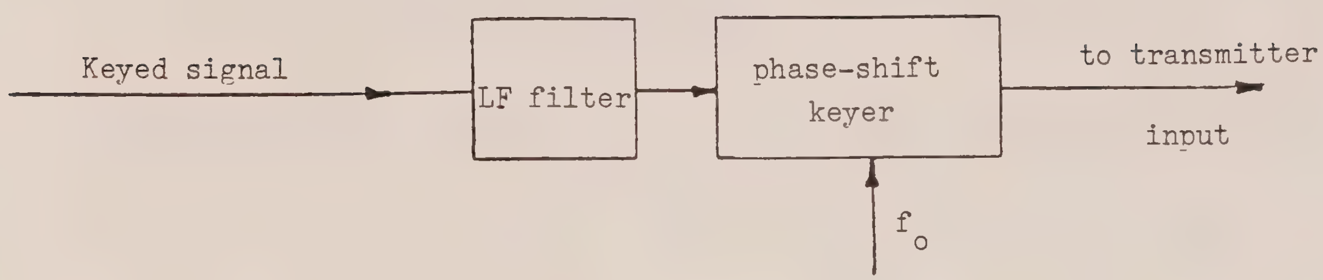
Ship-to-shore

Link : Yalta - Atlantic

System B (FEC)

Frequency, kHz Distance, km	Date and time (Moscow time)	Number of characters transmitted and error probability				
		FSK - 100 probability characters	NBPSK - 100 lower channel probability characters	NBPSK - 100 upper channel probability characters	NBPSK - 100 mean value probability characters	NBPSK - 200 probability characters
6570 kHz 2800 KM	I5.0I.85 02.00-08.00	$2xI0^{-2}$ 2I600	$I,2xI0^{-2}$ 20000	$I,0xI0^{-2}$ 2I000	$I,IxI0^{-2}$ 4I000	$2xI0^{-2}$ 4I000
8436 kHz 3200 KM	I6.0I.85 02.00-08.00	$I,2xI0^{-I}$ 2I000	$0,4xI0^{-I}$ 20000	$0,5xI0^{-2}$ I9000	$0,45xI0^{-2}$ 39000	$I,4xI0^{-I}$ 42000
I7064 kHz 4200 KM	I6.0I.85 I4.00-I7.00	$I,5xI0^{-I}$ I8000	$0,9xI0^{-2}$ I9000	$0,7xI0^{-2}$ I7000	$0,8xI0^{-2}$ 36000	$I,6xI0^{-I}$ 35000
8436 kHz 5I00 KM	I7.0I.85 02.00-08.00	$5xI0^{-2}$ 2I000	$3xI0^{-2}$ 20500	$2xI0^{-2}$ 2I000	$2,5x\ I0^{-2}$ 4I500	$6xI0^{-2}$ 42000
8436 kHz 5500 KM	I8.0I.85 02.00-06.00	3xI0-2 I7000	I,5xI0-2 I7000	$2,0xI0^{-2}$ I6500	$I,8xI0^{-2}$ 34000	$4xI0^{-2}$ 34000
I7I03,2 kHz 6I00 KM	I8.0I.85 I4.00-I7.00	$8xI0^{-2}$ I0000	$5xI0^{-2}$ II000	8xI0-2 II000	7xI0-2 22000	9xI0-2 22000
6570 kHz 6700 KM	I9.0I.85 02.00-06.00	$7xI0^{-2}$ I2000	$3,5xI0^{-2}$ I2500	6,0xI0-2 I2000	5xI0-2 24500	8xI0-2 24000
I7064 kHz 6900 KM	I9.0I.85 I4.00-I7.00	$6xI0^{-2}$ I0000	$4xI0^{-2}$ II000	$6xI0^{-2}$ II000	$5xI0^{-2}$ 22000	$7xI0^{-2}$ 22000
Mean error probability for entire test period		$P_{FSK} = 8 \times 10^{-2}$		$P_{NBPSK-100} = 6x10^{-2}$	$P_{NBPSK-200} = 9 \times 10^{-2}$	

a) Filtering of keyed signal



b) Filtering of phase-shift keyed signal

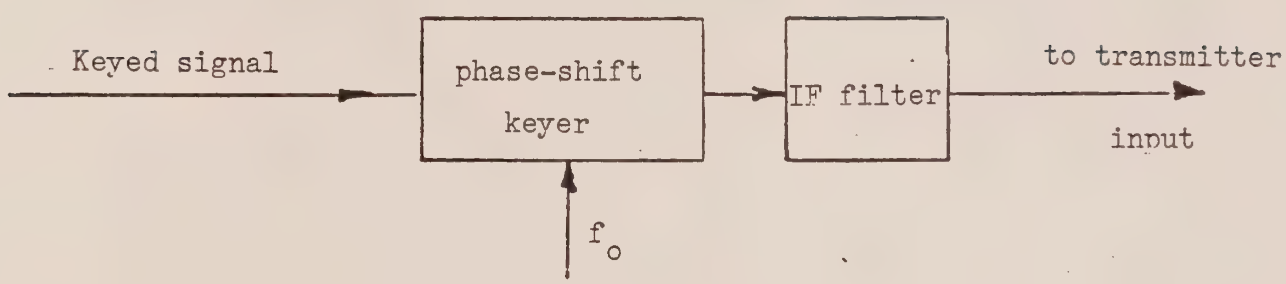


FIGURE 12

AMPLITUDE-FREQUENCY RESPONSE OF NBPSK SIGNAL FORMING FILTER
(telegraph speed 100 bauds)

Characteristic points

Bandwidth at level - 1.5 dB = 110 Hz

Bandwidth at level - 15 dB = 180 Hz

Bandwidth at level - 30 dB = 260 Hz

Bandwidth at level - 40 dB = 500 Hz

Bandwidth at level - 50 dB = 700 Hz

Bandwidth at level - 60 dB = 900 Hz

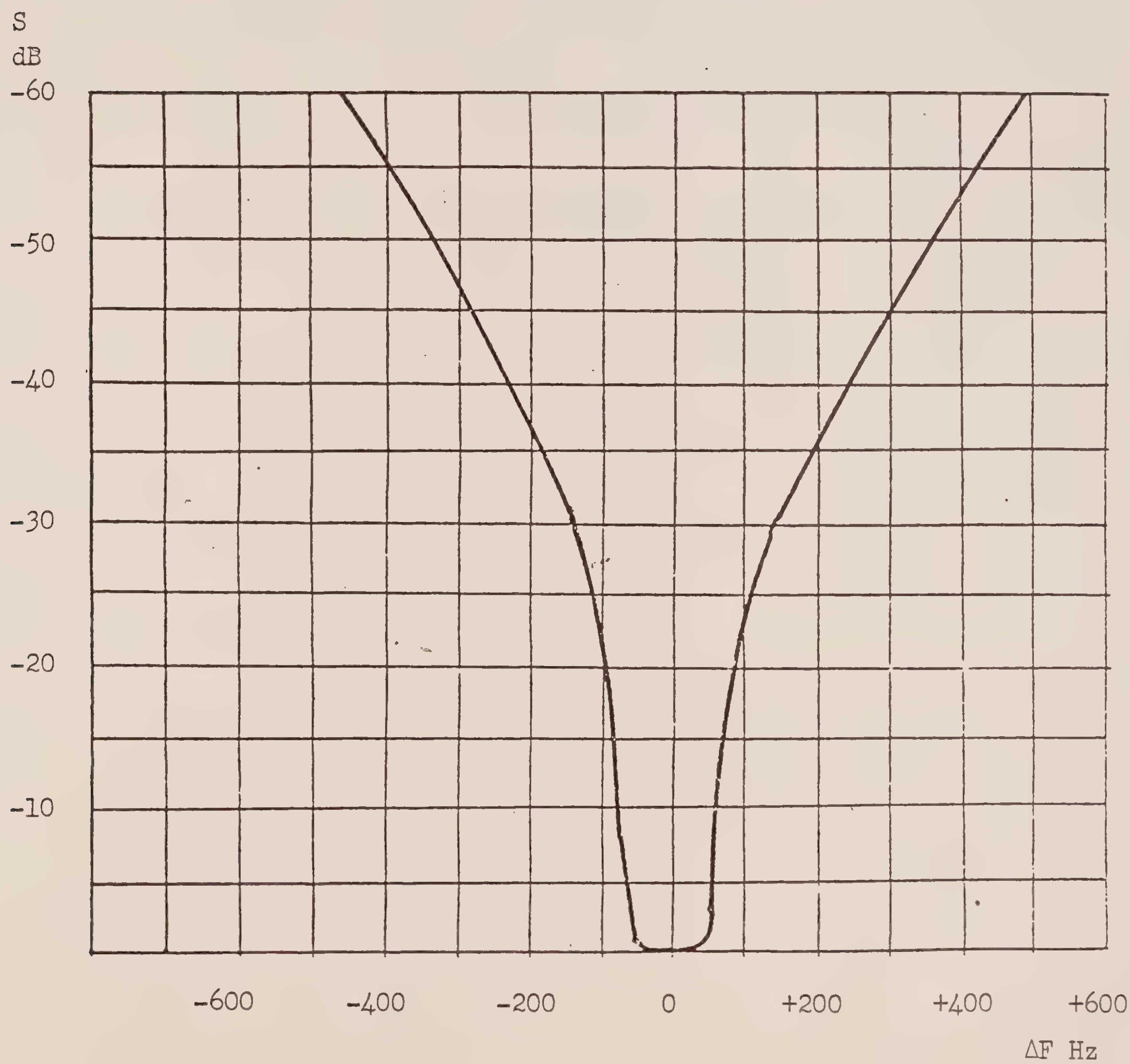
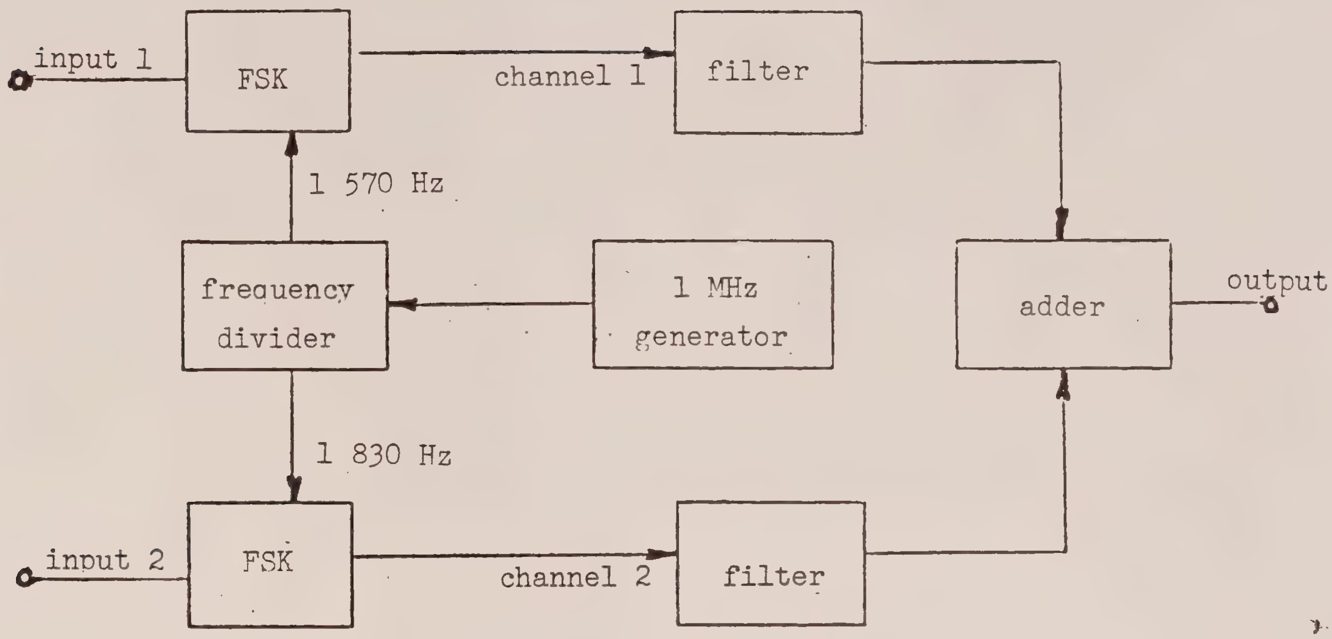


FIGURE 13



FSK - phase-shift keyer

FIGURE 14

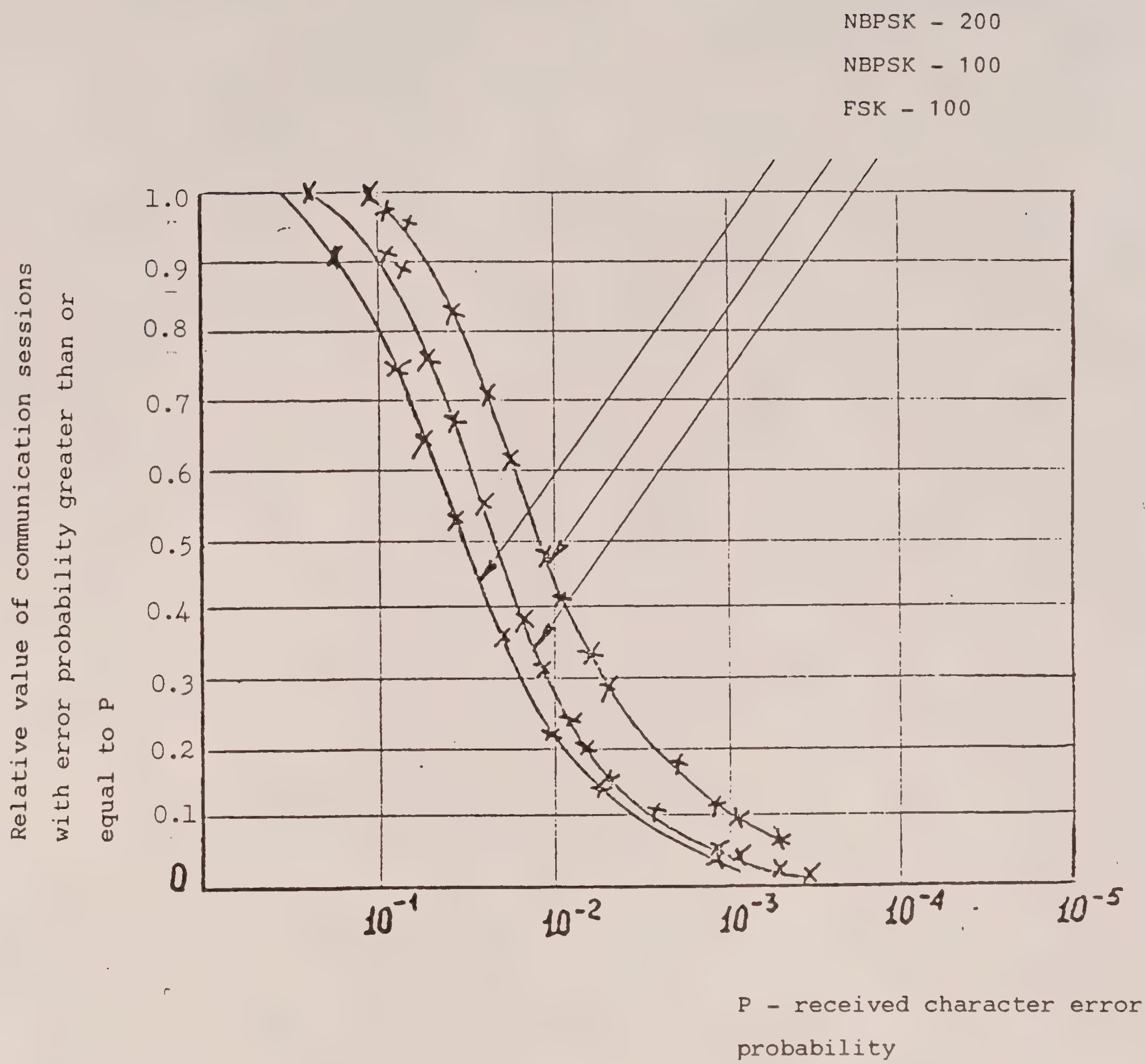

NBPSK - 200
NBPSK - 100
FSK - 100
Relative value of communication sessions with error probability greater than or equal to P
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
P - received character error probability

FIGURE 15

Documents
CCIR Study Groups
Period 1982-1986

Document 8/343-E
2 July 1985
Original: Russian

Subject: Question 54/8

USSR

DRAFT NEW RECOMMENDATION
(Question 54/8)

TECHNICAL CHARACTERISTICS FOR HF MARITIME RADIO EQUIPMENT USING NARROWBAND PHASE SHIFT-KEYING (NBPSK) TELEGRAPHY

The CCIR,

CONSIDERING

(a) the fact that direct printing communication modes are currently being widely introduced in the maritime mobile service;

(b) that the frequency stability of ship radio receivers and transmitters has considerably improved;

(c) that synchronous 7-unit codes with error detection are widely used in direct-printing links;

(d) that the load on direct printing channels in the HF maritime mobile service has increased;

(e) that NBPSK signals are received with better noise immunity than FSK signals at the same transmitter power;

(f) that the use of NBPSK telegraphy allows two PSK channels to be accommodated in one standard channel of narrowband telegraphy in the maritime mobile service at a modulation rate in each channel of 100 bauds or one PSK channel at a modulation rate of 200 bauds;

(g) that the level of mutual channel interference in PSK mode does not exceed that of FSK mode;

RECOMMENDS

that when NBPSK telegraphy equipment is used in the HF maritime mobile service, the equipment characteristics must meet the requirements indicated in the annex.

Annex: 1

ANNEX

1. The modulation rate on the radio link must be 100 or 200 bauds.

2. The carrier wave phase modulation rule must be the following:

In the transmission of unit Y, the carrier wave phase changes by 180° relative to the phase of the preceding bit: but in the transmission of unit B, the carrier wave phase remains the same as for the preceding bit.

Note - Units B and Y are defined in Recommendations 476 and 490.

3. The deviation of the information sequence transmission rate from the nominal value must not exceed ± 0.01 bit/s.

4. The necessary bandwidth for the transmitter emission is:

1) not more than 110 Hz for a rate of 100 bauds;

2) not more than 210 Hz for a rate of 200 bauds.

5. The reduction of the mean emission power at the maximum modulation rate on the radio link compared with the mean emission power of the unmodulated carrier at the transmitter output must not exceed 4 dB.

6. The width of the out-of-band emission spectra at the transmitter output at a modulation rate on the radio link of 100 bauds:

6.1 30 dB referred to unmodulated carrier of not more than 260 Hz;

6.2 40 dB referred to unmodulated carrier of not more than 500 Hz;

6.3 50 dB referred to unmodulated carrier of not more than 700 Hz;

6.4 60 dB referred to unmodulated carrier of not more than 900 Hz.

7. The width of the out-of-band emission spectra at the transmitter output at a modulation rate on the radio link of 200 bauds:

7.1 30 dB referred to unmodulated carrier of not more than 520 Hz;

7.2 40 dB referred to unmodulated carrier of not more than 1 000 Hz;

7.3 50 dB referred to unmodulated carrier of not more than 1 400 Hz;

7.4 60 dB referred to unmodulated carrier of not more than 1 800 Hz.

8. The standard maritime mobile service narrowband telegraphy channel may accommodate two PSK sub-channels at a maximum modulation rate of 100 bauds in each PSK sub-channel.

The frequency of one PSK sub-channel at 130 Hz is lower than the assigned frequency of a standard narrowband telegraphy channel, and the frequency of the second sub-channel is 130 Hz higher than the assigned frequency.

9. The transmitter must use class of emission G1B or single-sideband classes J2B or J7B.

10. If class J2B is used, the frequency of the sub-carrier signal reaching the low-frequency input of the transmitter must be 1 570, 1 700 or 1 830 Hz, while the frequency deviation of the sub-carrier from the nominal value must not exceed ±0.5 Hz.

11. If class J7B is used, the frequencies of the sub-carrier signals reaching the low-frequency input of the tranmsitter must be 1 570 and 1 830 Hz, while the deviation of the sub-carrier frequency from the nominal value must not exceed ±0.5 Hz.

12. The maximum transmitter frequency deviation from the nominal value must not exceed ±4.5 Hz.

13. The linearity of the amplitude characteristics of the transmitter information signal amplification channel must be such that the level of combinational components do not exceed - for the third order, 31 dB, for the fifth order, 38 dB and, for the seventh order, 43 dB.

14. The maximum deviation of the frequency established by the receiver tuning units from the nominal value must not exceed ±4.5 Hz.

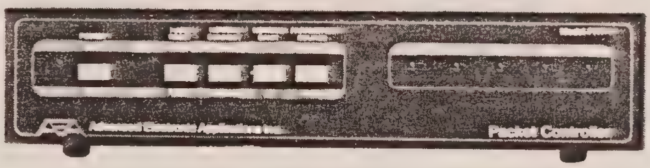
よくわかる
ハムのパケット通信

JA3ODC 秦 正人

NTT 日本電信電話株式会社の誕生により，ニュー・メディアがわたしたちの社会にとってさらに身近なものとなりました。

同じように，アマチュア無線の世界では，ニュー・メディアの技術の一つ パケット通信が，専用コントローラーの登場により身近なものとなって，あちこちでその電波が聞かれるようになりました。

この稿では，この身近になったハムのパケット通信をわかりやすく解説していただきます。 (編集部)



●PKT-1

パケット通信などという耳新しい言葉を聞いて，いったいそれは何なんだろう，むずかしくてよくわからない，と思う方も多いと思います．ところがこの4月より，国内のワード㈱からパケット通信が簡単に楽しめるパケット・コントローラーPKT-1が発売され，パケット通信が一挙に身近なものとなってきました．そこで，PKT-1を実際に使ってみた経験をもとに，ハムのパケット通信について解説したいと思います．

パケット通信とは？

パケット(Packet)とは本来，小包みという意味．私たちは荷物を送りたいとき，荷物を包んで小包みを作り，そこに宛名と差し出し人名を書いて送ります．パケット通信でもこれと同じようなことを情報(送りたい荷物)に対して行うので，この名前が付きました．

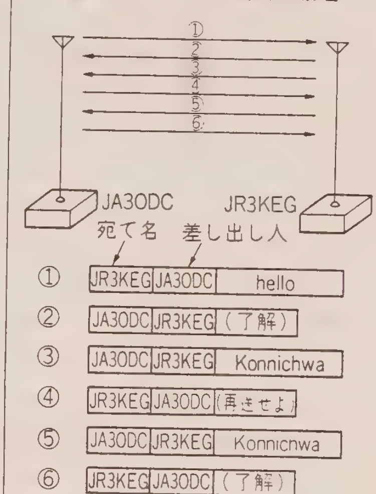
パケット通信は，送りたいデータをある長さに区切り，それぞれに宛名(相手のコールサイン)や差し出し人名(自分のコールサイン)などを付けたパケットとして送信します(第1図)．ただし，入力されたデータを適当な長さに区切ってパケットを作るのは，機械が自動的にやります．各パケットは電波に乗せられて相手局まで送られますが，その間に，送ったはずのデータが雑音や混信などによって間違って受信されることも起こります．このような誤りに対して各パケットは，伝送中に発生した誤りを検出することができる機能を備えています．したがって，受信側では受け取ったパケットを検査し，もし誤りを発見したときには，自動的に送信側に対して今のパケットを再送信するようなメッセージのパケットを送信し，今のパケットを再度送ってもらいます．また，正しく受信した場合には，了解というメッセージのパケットを返します．これらもすべて機械が自動的にやってくれます．

このような誤りパケットの自動再送機能の結果，最終的に受信側のオペレーターが見るデータには誤りは含まれていません．

さらに，パケットにはそれぞれ発信・受信局のコールがはいっていますので，特定の局だけを自動的に呼び出すことができます．いま，A局がB局を呼び出したいとき，A局からの呼び出しのパケットを受信したB局のパケット・コントローラーは，自分が呼ばれていることがわかるので自動的に応答し，A局との回線を設定します．

また，B局と交信中にたとえばコンディションが悪くなったり，B局のリグがトラブルを起こして電波が出せなくなったような場合，

第1図 パケット通信の原理



設定されている回線を自動的に終了させる機能も持っています．

パケット通信では，このような高度の機能のほとんどを，パケット・コントローラーが自動的に行うのが特徴です．

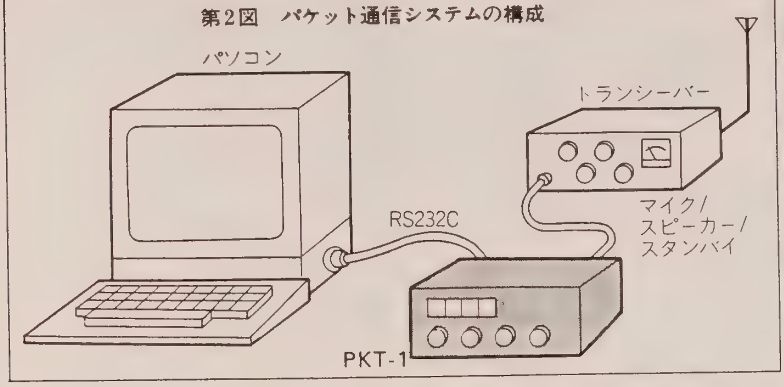
AX．25ってなんだろう？

パケット通信では，これ以外にも多くのことをパケット・コントローラーが自動的に行います．しかし，複雑なことをやろうとすればするほど，事前の綿密な取り決めが必要となってきます．

このような通信上の取り決めのことを，プロトコル(Protocol)といいます．このプロトコルには国際的な取り決めによってさまざまなものがあります．ハムの世界に

〒564 大阪府吹田市江の木町3-8-206

第2図　パケット通信システムの構成



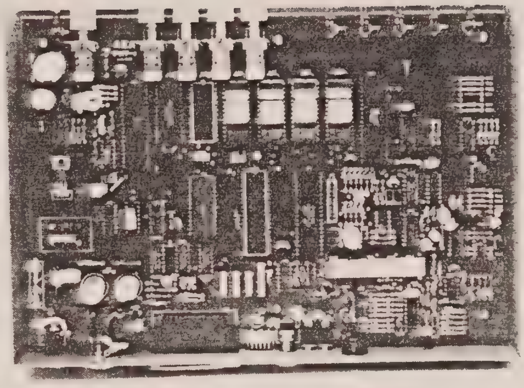


写真1　PKT-1の内部の様子

も，種々のパケット通信プロトコルが普及し混乱が起こることが予想されたので，アメリカのARRLでは委員会を設けて，ハムの世界で統一的に使えるプロトコルを昨年10月に定めました．このプロトコルをAX.25と呼んでいます．これは，X.25という商用データ通信プロトコルをハム用に拡張したものです．AX.25が，今のところ権威ある組織が定めた，世界で唯一のハム用のプロトコルなので，よほどすぐれた対抗馬が現れない限り，ハムのパケット通信プロトコルとして，今後世界中に普及していくものと思われます．

PKT-1ってなんだろう？

AX.25はパケット通信を行うための規則にすぎませんから，実際にパケット通信を行うには，AX.25を実行できる，ソフトウェアとハードウェアを持った機械が必要となります．このような機械をパケット・コントローラーとか，TNC(Terminal Node Controller)と呼んでいます．PKT-1は現在日本で入手可能な唯一のパケット・コントローラーの完成品(**写真1**)です．これ以外にも，アメリカではTAPR(Tucson Amateur Packet Radio Corporation)という非営利団体が販売しているキットや，このキットをベースとした製品がヒース・キットやカントロニクス社から出ています．

PKT-1を用いたパケット通信システムの構成例を第2図に示します．つまり，PKT-1以外に通信機能としてRS232Cを持ったパソコンが必要となります．もちろん，RS232Cが付いていればどんな機種でもかまいません．PKT-1はCPUを備えており，これ自体でも小型のコンピューター・システムです．送・受信機との接続はマイク／スピーカー／スタンバイ／(スケルチ)によって行います．最後のスケルチはつながなくても動きます．

まず，パソコン側では単にキーボードからの入力をRS232Cポートへ送信し，逆にRS232Cポートからの受信データを画面に表示する，最も単純なターミナル機能があれば，PKT-1を介してパケット通信を楽しめます．このようなターミナル機能は，最近のパソコンではターミナル・コマンドとして内蔵されているものも多く，また簡単に自分でプログラムすることもできます．

パソコン側から入力したデータ(文字や数字など)は，このRS232Cを通ってPKT-1へ送られます．PKT-1はこのデータがパケットとして送信すべきデータか，それとも自分に対する命令(コマンド)かどうかを判断します．そして，送るべきデータならばパケットを組み立て，送信機から送れるよう，オーディオ信号に変調します(FSK：周波数シフト・キーイングを採用)．

そして，送信機をONして，自動的にマイク入力からパケットとなったデータを送信し，終われば自動的に受信に戻ります．もちろん，その後，相手からの返事のパケットを解読し，次のデータを送ったり，また，誤りによるパケットの再送信の要求であれば，そのパケットを再送します．

また，パソコンからのデータがコマンドならば，あらかじめ決められた動作を行います．PKT-1には約75ものコマンドがあります．これらのコマンドは非常に使いやすく，さまざまなことを簡単に実行・設定・変更することができます．たとえば，パケットに自動的に付けられる自局のコールサインは，「mycall JA3ODC」と打つだけで設定でき，JR3KEGと話したいときは「c JR3KEG」と打つだけで，自動的にJR3KEGを呼び出します(cはConnectの略)．

そして，もしJR3KEGのパケット通信システムがONであれば，自動的に通信可能な状態にしてくれます(これを回線の設定と呼ぶ)．ところが，もしコンディションが悪かったり，あいにく相手局がOFFになっていたりすると，たとえば10回呼び出しを試みた後，回線の設定が不可能と判断し，自動的に呼び出しを終了します(このような最大の呼び出し回数もコマンドで設定できる)．

これ以外にも第1表のようなたくさんのコマンドがあります．これらはPKT-1の日本語マニュ

アルに詳しく説明されています.

PKT-1の主な基本機能

1. 誤りのないデータの送受信.
2. 交信したい局の自動呼び出し，呼び出しに対する自動応答.
3. ディジピーター機能によるパケットの中継.
4. ビーコンの自動送信.
5. CWによるIDの自動送信.

PKT-1では，交信したい局を呼び出すときに，そのパケットを中継する局のコールを指定することができます．たとえば「c JR3KEG v JE3MXQ，JH3CLK」とすればJE3MXQとJH3CLPを中継してJR3KEGと交信することができます．「v」は「via」を意味します．この場合，中継を行うJE3MXQやJH3CLKには人がいなくても，パケット・コントローラーさえONになっていれば，自動的に中継を行います.

このように，パケットを自動的に中継する機能をディジピーター機能といい，この機能を使うと最大8局までを経由して9番目の局にパケットを送ることができます．PKT-1は，特に意識的にディジピーター機能をOFFにしていない限り(コマンドでOFF可能)，どれでもディジピーターとなることができます．ディジピーターを使う場合でも，ちゃんと誤りの検査を行いますので，最終的なデータには誤りはありません.

山やビルの頂上などにディジピーターを設置すれば，広範囲をカバーできるパケット通信のネットワークが簡単に作れます.

PKT-1の構成

第3図にブロックダイヤグラムを，第2表に仕様を示します．パケットに関する処理を専用のLSI(WD-1933)に任せてCPUの負担を軽くしています．また，パラレル・ポートはオプションです.

第1表　コマンドの一例

〔直接コマンド〕
- CALIBRATE：内蔵のAFSKなどの校正ルーチンへ.
- CONNECT：パケット通信の回線を設定.
- CONVERS：コマンド・モードからコンバース・モードへ.
- DISCONNE：回線を閉鎖する.
- など，ほか6とおり.

〔リンク・コマンド〕
- AX25：AX.25とVADCGの選択.
- CONMODE：回線設定時にどのモードに自動移行するかを選択.
- CONOK：他局からの回線設定要求に応じるかどうかの選択.
- DIGIPEAT：ディジピーター機能のON. OFF.
- など，ほか11とおり.

〔ターミナル・コマンド〕
- ABAUD：PKT-1とターミナルとの間のRS232Cの速度を設定.
- ABIT：ストップ・ビット長の設定.
- AUTOLF：ターミナルに(LF)を自動送信するかどうかを選択.
- AWLEN：キャラクター長を7と8から選択.
- など，ほか12とおり.

〔キャラクター・コマンド〕
- CANLINE：一行取り消しコマンドのASCIIコードを設定.
- CANPAC：パケット・ターミナル編集コマンドのASCIIコードを設定.
- COMMAND：コマンド・モードにハイルためのASCIIコードを設定.
- DEBUG：デバッグ・プログラムへのエントリー・コードの設定.
- など，ほか8とおり.

〔ID・コマンド〕
- BEACON：ビーコン送信のリピート間隔を設定.
- BTEXT：ビーコンで送信するテキストを設定.
- MYCALL：自局コールサインを登録します.
- など，ほか4とおり.

〔モニター・コマンド〕
- MALL：回線設定されていないパケットだけか，すべてを受信するかを選択.
- MCON：回線設定後もモニターを継続するかどうかを選択.
- など，ほか3とおり.

〔タイミング・コマンド〕
- CMDTIME：トランスペアレント・モードのタイム・アウト時間を設定.
- CPACTIME：PACTIMEを使用するかどうかを選択.
- DWAIT：ディジピーター使用時のデータ衝突回避のための時間設定.
- など，ほか3とおり.

第2表　PKT-1の仕様

〔プロセッサー〕
- 6809 8ービット・マイクロ・プロセッサー
- Western Digital 1933 HDLC(ハイレベルデータ・リンク・コントローラー)

〔インプット／アウトプット〕
- RS232C：50～19200ボー(自動追従可能ボーレート：110/300/1200/4800/9600)
- PTTコントロール端子
- パラレル・ポート(オプション)
- 受信用AF入力端子(外部スピーカー端子付)
- スケルチ入力端子(チャネル・モニター用)

〔メモリー〕
- ROM：32K　2764
- RAM：8K　6264 データ・バッファー
- RAM：32Kまで拡張可能
- NOVRAM：128バイト 2212 novolatile ram

〔モデム〕
- AFSK(1200/2200Hz，ベル202規格)
- 300ボー(HF)，1200ボー(V/UHF)
- 自己校正ルーチン内蔵
- 外部モデム使用可能
- 2206(AFSK)，2211(復調)，MF10(4ポール・フィルター)

〔プロトコル〕
- AX.25およびVancouver VADCC(ソフト選択)，全および半2重切換可データ・リンク.

〔オペレーション・モード〕
- コマンド・モード：シリアル/パラレル・ポートより入力
- 対話モード：データ入力，パケット送受，編集(文字/行/パケット/消去，再表示)
- 透過モード：ディジタル・データ入力，パケット送信，パケット受信

〔コントロール〕
- スイッチ：電源/リセット/NOVRAMバンク選択/NOVRAM切り離し

〔表示〕
- LED：電源/AFSK入力/データ・キャリア検出/PTT/送信データ

〔電源〕
- 電圧：9～15V DC (1A)
- 過電圧保護：18V DCにて作動
- 逆極性接続保護回路内蔵

普通の使用では，シリアルI/Oだけで何の問題もありません.

一方，ソフトのほうでは32KバイトものROMを搭載し，かなり充実しているので，どんなターミナルからでも，簡単にPKT-1を使うことができます(文献3に詳しい内部の解説あり).

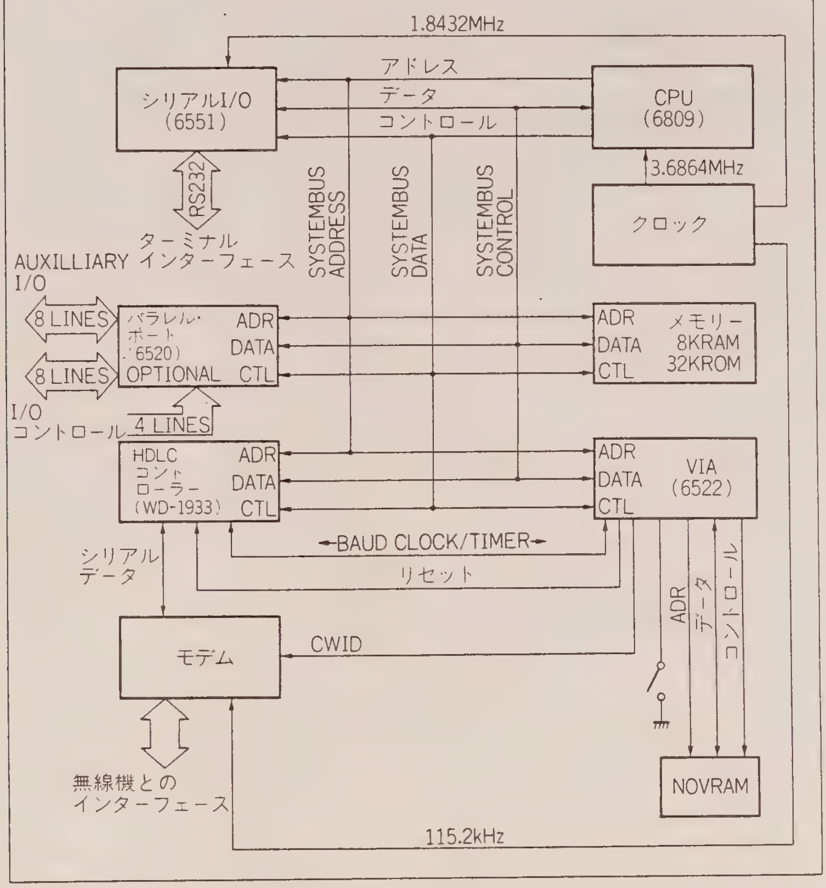
PKT-1の使用例

PKT-1には約50ページにわたる和文の取説が付いています．これにしたがって操作を行います.

PKT-1とパソコンとの通信速度の初期値は300ボーになっていますが，コマンドABAUDによって好きな速度に設定できます(4,800ボーまで可能)．さらに，自局のコールなどを設定します．このようなパラメーターは一度設定した後，NOVRAMという不揮発性のメモリーに書いておくと，次に電源を投入した際にも，設定したパラメーターが残っている機能も持っています．つまり，このようなパラメーターについては，一回だけ設定しておけば，次からは設定し直す必要はありません.

一方，送信機から出て行くFSK信号の伝送速度は，コマンドHBAUDによって設定します．PKT-1では内蔵モデムの制約から，1,200ボー以下の速度をサポートしています(2,400ボー以上は

第3図　PKT-1のブロックダイヤグラム



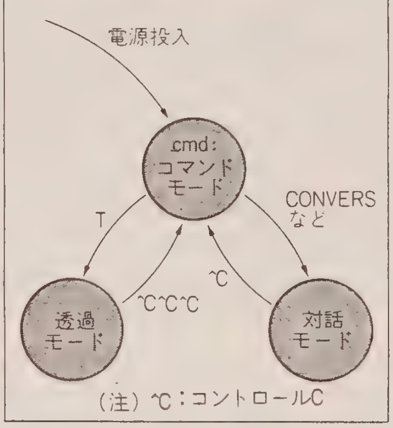
第4図　PKT-1の立ち上げとCQ（受信局があれば▭のように出る）

```
AEA  Packet Radio
RAM length is 2000
*** parallel port can't init
cmd:convers
Donataka nyuukan arimasenka ?

JA3ODC>CQ:Donataka nyuukan arimasenka ?

cmd:c JR3KEG
cmd:*** CONNECTED to JR3KEG
Hello Yamauchi-kun. How are you today?
cmd:c
Link state is: CONNECTED to JR3KEG
cmd:d
cmd:*** DISCONNECTED
```

第5図　PKT-1の動作モード



外付けのモデムが必要）．そして，特にオスカー用に400ボーもサポートしています．ただし，このＦＳＫの速度とパソコンとの接続速度とは，まったく関係がありませんので，どちらも自由に設定できます．実際の実験ではどちらも1,200ボーで行いました．

第４図にＰＫＴ-１の立ち上げ時の一例と，ＣＱを出す方法を示します．

ＰＫＴ-１には第５図のように三つの動作モードがあります．

コマンド・モードではさまざまなコマンドを実行します．また，対話モードでは通常の交信を行います．つまりキーボードから入力した英数字を，特定のキー入力を合図にしてパケットを作り送信します．イメージとしてはＲＴＴＹの交信とよく似ています．このモードでは，パケット化して送信する合図に用いる文字のように，あらかじめ決められた特定の文字は，送ることができません．

ＰＫＴ-１は，パソコンから送られてくるデータの中からこのような文字を見つけて，その文字に対応する動作を実行します．したがって，このような文字はパケットには入れません．

普通の交信であればこのモードで十分なのですが，プログラムや漢字などのように英数字以外の文字を含んでいるようなデータは，送ることができません．このような目的のために，透過モードが用意されています．このモードではＰＫＴ-１は，パソコンからのあらゆる文字をパケットにして送信します．したがって，パソコンから見てＰＫＴ-１は存在しないかのごとくなります．これが透過モードと呼ばれるゆえんです．

第６図に示す漢字による交信の例は，この透過モードで実験したものです．ＰＣ-9801のMSDOS上で，日本語ワープロのようにかな漢字変換が行えるVJEを用いて，日本語ワープロを打つような感覚でパケット通信ができます．

パケット通信のこれから

ＰＫＴ-１の機能を十分に引き出すためには，パソコン側も単なる文字の送受を行なうターミナルではまったく不十分で，これでは従来のＲＴＴＹとあまり変わりません．機能を十分に発揮するためには，ある程度の機能を持ったパケット通信用のターミナルが必要です．このような，ある程度の機能を持ったターミナル用ソフトがそろった場合に可能となる，さまざまな応用例を夢に描いてみます．

■電子メイル：特定の局に対してパケットでメッセージを送り，もし，その局のオペレーターがいなくても自動的にその局のフロッピーやカセットにメッセージが記録され，その人が帰ってきたときにメッセージを見ることができるシステム．スケジュールや，ミーティングの案内などに便利．ディジ

第6図　透過モードでの漢字・英語QSO例(ターミナルは自作のプログラム)

```
cmd:c
Link state is: CONNECTED to JA3USA
cmd:t

どうですか 。 日本語でパケット通信をやることは？
 -------------- received data ------------------
It's just fantastic !!
 -----------------------------------------------
日本語ですから漢字が感じよいことも送れますね！！
 -------------- no received data ---------------
島本さん！！！おーーーーーい！！！ 島本さん！！
 -------------- received data ------------------
It is kind of slow. isn't it?
 -----------------------------------------------
そうかな？確かに。こっちのほうはかな漢字変換を
やってますからね！
 -------------- received data ------------------
SO KANA.
 -----------------------------------------------
は は は は は
それでは 電話にいきましょうか？
 -------------- received data ------------------
We are doing Japanese - English conversion. HI
 -----------------------------------------------
cmd:c
Link state is: DISCONNECTED
cmd:
```

ピーターを使って日本中がネットされれば，強力な連絡網となる．

■ＢＢＳ：電子掲示板(Bulletin Board Service)．どこかの局がＢＢＳ用のソフトを走らせ，ほかの局はそこへ自由にアクセスして好きなメッセージを書いたり，他人が書いたものを見ることができるというもの．売りたし・買いたし情報，会合の宣伝，トラブルの相談などの使い道が考えられる．これも，ディジピーターのネットを使えば，全日本的規模で行える．

■データ・バンク：ＤＸニュース，ＪＣＣサービス情報，ＱＳＬマネジャー情報などを，それぞれの専門局が一括して入力しておき，各局はそこへアクセスしてその情報を見るというもの．ニュース・レターや雑誌などの印刷物に比べ，情報の伝達能力は断然速い．

■ゲーム：パケットを使って将棋やチェスを二人で楽しめる．他局はその対局を観戦したり，ヤジを入れたりすることもできるようにすれば楽しい．

■ファイル転送：主にプログラムの交換などに使う．透過モードを使えば，アスキー・ファイルだけではなく，コンパイルしたようなバイナリー・ファイルでも送れる．こういう場合，伝送による誤りがないパケット通信の利点が最大限に生かされる．

■リモート・コントロール：帰宅途中のモービルの中や職場から，携帯用のパケット・システム(ハンドヘルド・コンピューター)を使い，わが家のシステムを呼び出し，門灯を付けたり，電子メイルを読んだりできる．

■アマチュア衛星：近く打ち上げられるＪＡＳ-１では，ＡＸ.25によるパケット通信専用のチャネルがある．これを使えば，ＤＸ局とのパケットによる交信ができる．

■公衆電気通信網との接続：自宅から遠方のコンピューターをＴＳＳで使いたいとき，電話回線で音響カップラーでつなぐというのが一般的だが，電話代が高くつく．そこで，コンピューターの近くまでは無線のパケット通信で送って，そこから有線でコンピューターにつなぐという方法が考えられる．ただし，現行の電波法では若干の問題が残る．一つの可能性としては面白いだろう．

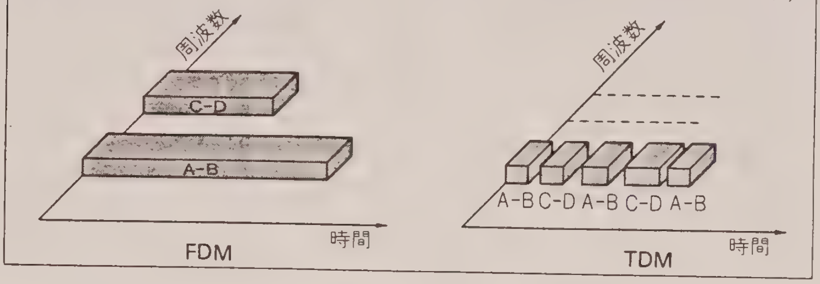
*　　*

パケット通信は，これまでのアマチュア無線にはなかった新しい概念がいくつか含まれています．

まず第一に，チャネルの利用形態が変わります．これまでのアマチュアの通信では，交信している局が，ある周波数の幅を独占して交信を行う形態をとってきました．したがって，同じチャネル上で，近接する二組以上の局が同時に交信するということは不可能でした．

ところが，パケット通信では，データはパケットという時間的に短いバースト的な形で伝送されるので，チャネルには空き時間がたくさんできます．このすき間を他局が使うことが可能となります．もちろん，双方のパケットが衝突して共倒れとなる*こともたまにはありますが，誤り検出とパケットの再送機能で，これを克服できます．従来の周波数を分けて，多くの局が共存するのを周波数分割多重(ＦＤＭ：Frequency Division Multiplex)というのに対し，パケット通信の場合のように，同じ周波数でも時間的に分けて共存するのを時分割多重(ＴＤＭ：Time Division Multiplex)といいます(第７図)．

第７図　FDMとTDMの違い(ブロックはA局とB局，C局とD局が使用中を示す)



第二は電子メイルなどにみられるように，情報をいったん蓄積して伝えることが可能となる点です．これまでのアマチュア無線ではいかに遠くの人と交信するかということが一つの大目標でした．別の言葉でいえば，通信の「空間的な拡大」ということになります．

ところがパケット通信では，今はいないにしても，明日旅行から帰ってくるはずの人への通信が可能なわけで，これは通信の「時間的な拡大」といえます．

パケット通信の今後の発展を考えると，従来からある電話などによる通信と競合するのではなく，今までにはなかった，まったく新しい楽しみを与えてくれる通信方式として普及していくでしょう．

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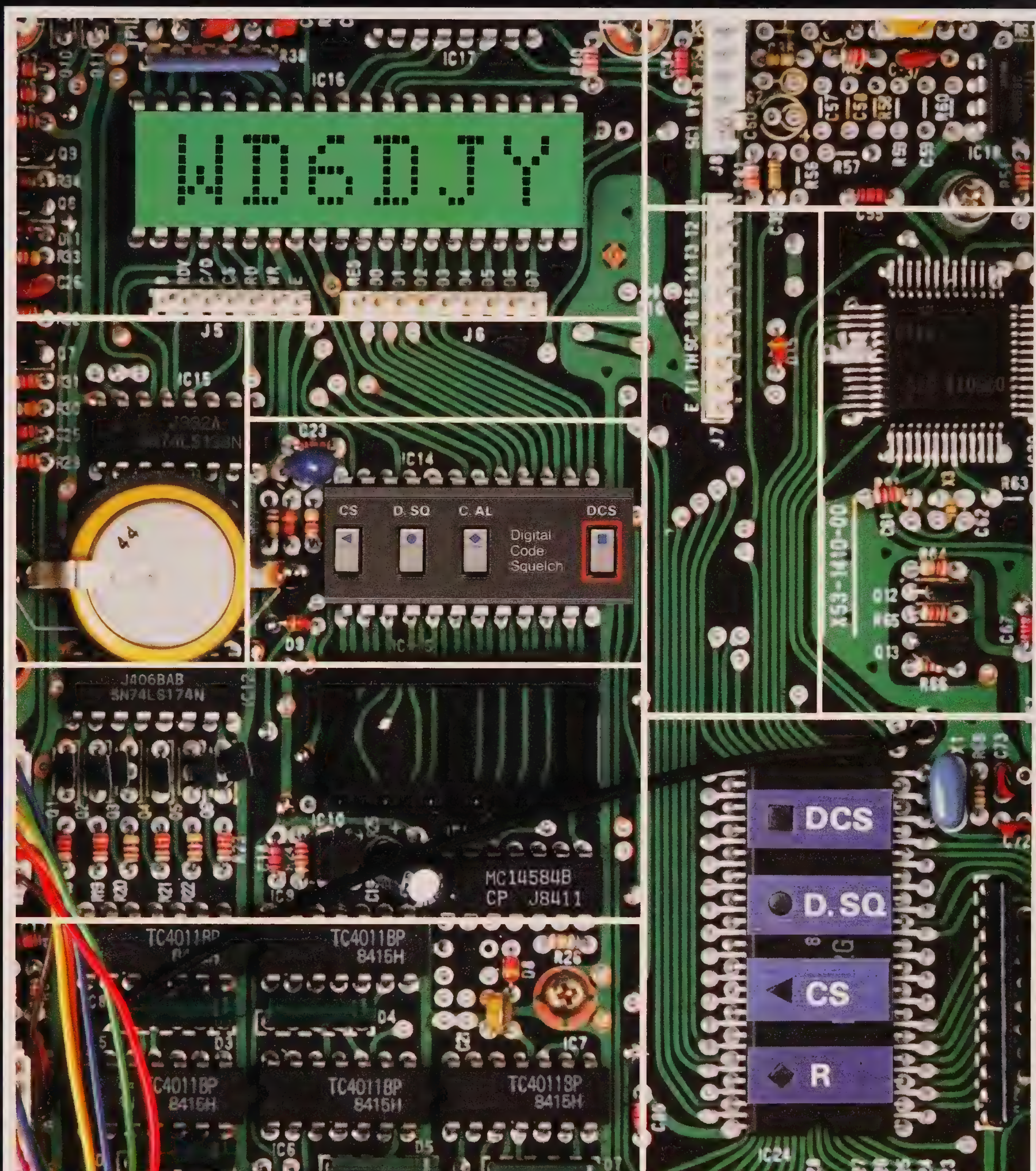
*このように各局がパケットの衝突を覚悟のうえで，好き勝手にパケットを送り出すような通信形態をＡＬＯＨＡ方式と呼ぶ

KENWOOD

DCS "Digital Code Squelch"



DCS "Digital Code Squelch"

TRIO-KENWOOD's new DCS "Digital Code Squelch" is a revolutionary signalling concept for Amateur Radio that utilizes current state-of-the-art technology. This new technology is a major feature of the new TR-2600 A/E, TR-3600 A/E "2-m and 70-cm FM Handheld Transceivers", the TM-211A/E, TM-411A/E "2-m and 70-cm FM Mobile Transceivers", and the TS-711A/E, TS-811A/B/E "2-m and 70-cm All-mode Transceivers". The DCS should not be confused with conventional CTCSS (Continuous Tone Coded Squelch System). DCS uses a 5 digit, digitally coded data string, to open squelch on a receiver that has been programmed to accept this same specific code group. By utilizing a 5 digit code group the operator may choose from 100,000 possible combinations, thus providing increased security. In addition to the 5 digit "access code" the DCS also transmits the operators call sign, in decimal ASCII code. Call signs of a maximum of 6 digits may be entered. By using the optional CD-10 Call Sign Display, the operator may store incoming call signs, for later review or logging.

[FEATURES]

ERROR CORRECTION

The DCS utilizes an error correcting code system that reduces the possibility of errors due to electrical noise, etc.

100,000 DIFFERENT 5 DIGIT CODE GROUPS

Convenient keyboard entry of the "access code" is possible with all models equipped with the DCS.

CAPABLE OF MONITORING MULTIPLE ACCESS CODES

The DCS codes, and call sign data, are stored in separate memory locations within the host unit. This allows the operator to monitor several access code groups at one time. Clubs and nets will find this function useful, as will operators who wish to listen for more than one group at a time.

AUTOMATIC CALL SIGN TRANSMISSION

A 6 digit Amateur "Call Sign" is entered into the DCS memory using decimal ASCII coding, by use of the front panel keyboard. This call sign is then transmitted in conjunction with the DCS data string each time the P.T.T. switch is depressed or released. By using the optional CD-10 Call Sign Display the operator can automatically store up to 20 different call signs. This feature is useful for unattended monitoring of the radio. Upon return to the station the operator can review the CD-10 memory to determine who tried to contact him during his absence. This function is also useful for logging purposes.

CONVENIENT REPEATER OPERATION

The DCS uses a mark frequency of 1200 Hz and a space frequency of 1800 Hz which are within the normal speech bandwidth of most repeaters.

[DCS OPERATING THEORY]

Figure 1 shows the block diagram of the DCS. IC1 is the main CPU for the radio. It controls all input/output functions for both the radio and DCS. IC2 is the DCS CPU. It is controlled by the main CPU, and controls the DCS operation. IC3 is a MSK (Minimum Shift Keying), MODEM (Modulator/Demodulator). It provides an interface for transmission and reception of the DCS data to the main transceiver.

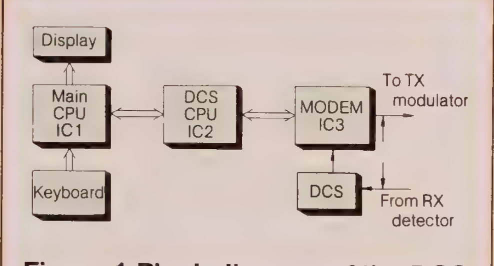


Figure 1 Block diagram of the DCS

CONTROL SIGNAL

The actual DCS signal is composed of 4 sections as shown in figure 2. Error correction is provided thru use of the Hagelberger method of data encryption.

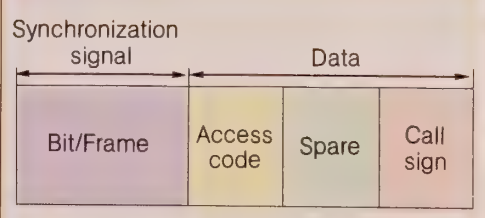


Figure 2 Control signal

1. Bit/frame Synchronizing signal
   This signal is used to distinguish between noise and data signals.
2. Digital Code Data
   This is the 5 digit access code.
3. Spare Data
   Control signal data reserved for possible future expansion of the DCS capabilities.
4. Call Sign Data
   A 6 digit alpha-numeric call sign is contained here in decimal ASCII code.

This control signal is transmitted at a Baud rate of 1200 bits/sec. An example of the control signal is shown in figure 3.

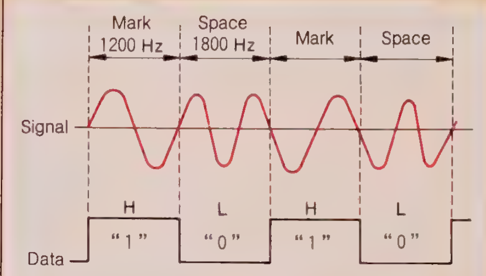


Figure 3 MSK signal data

The time required for transmission of this control signal is approximately 200 milliseconds and should not affect normal communications. Transmit audio is disabled during the period required for the DCS signal to be transmitted, to prevent possible interference to the DCS signal. Figure 4 shows an example of the actual transmitted signal from initial depression of the PTT switch to release of the PTT switch.

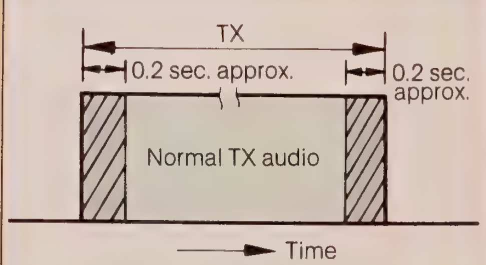


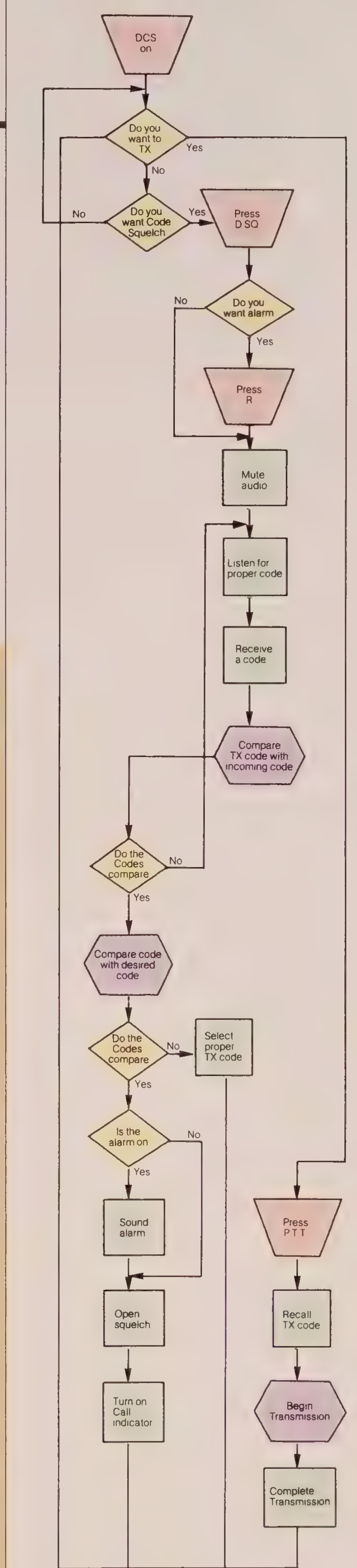
Figure 4 Transmitted signal

TS-711 A/E, TS-811 A/B/E: 2-m and 70-cm All-mode Transceivers.

TM-211 A/E, TM-411 A/E: 2-m and 70-cm FM Mobile Transceivers.

TR-2600 A/E, TR-3600 A/E: 2-m and 70-cm FM Handheld Transceivers.

* These DCS transceiver brochures are available individually for details.



ACCESS CODE AND CALL SIGN DATA ENTRY

The actual method of entry will vary from unit to unit. Some units enter data digit by digit, while other enter data in small groups. Specific instructions are contained in each transceivers operating manual. Call sign data is entered using decimal ASCII coding. See table 1.

A : 65	B : 66	C : 67	D : 68
E : 69	F : 70	G : 71	H : 72
I : 73	J : 74	K : 75	L : 76
M : 77	N : 78	O : 79	P : 80
Q : 81	R : 82	S : 83	T : 84
U : 85	V : 86	X : 87	W : 88
Y : 89	Z : 90	space : 32	
0 : 48	1 : 49	2 : 50	3 : 51
4 : 52	5 : 53	6 : 54	7 : 55
8 : 56	9 : 57		

Table 1 Decimal ASCII code table

CODE SQUELCH OPERATION

Refer to figure 5 for a flow chart of how the DCS operates.

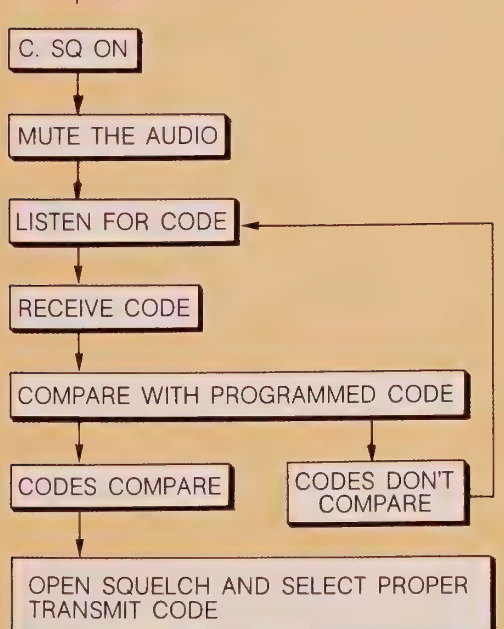


Figure 5 Flow chart

TRANSMITTER BLOCK TERMS

a) Mode of modulation F2 frequency modulating.
b) Signal composition.

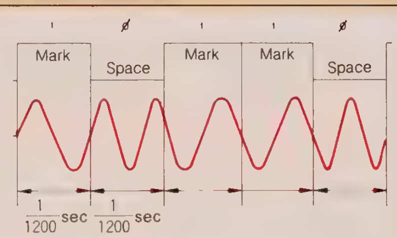


Figure 6 Signal (NRZ equal-length data)

- The DCS signal is a NRZ (Nonreturn-to-Zero) equal-length data string.
  Mark and space frequencies are 1200 Hz and 1800 Hz (each deviation : within ±200 ppm).
- Code transmission speed is 1200 bits/second (±200 ppm deviation).

c) Frequency deviation is from ±2.5 kHz to ±5 kHz for carrier frequency without modulation.

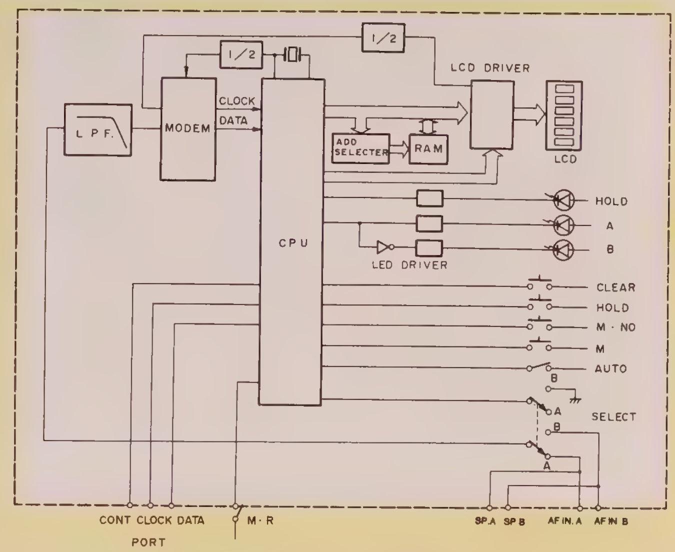
[BASIC OPERATION]

1) Press the DCS key, to turn on the DCS.
   The DCS LED indicator should light.
2) a) RX monitoring
   Squelch will open when the proper code is received.
   b) TX operation
   Depressing the P.T.T. switch causes the DCS access code signal to be transmitted.

[DCS control]
Code: .... NRZ equal-length Code
Modulation: .... MSK Modulation
Frequency Deviation: .... ±3.5 kHz standard (±2.5 kHz～±5 kHz)
Mark Frequency:........................ 1200 Hz (Deviation: ±200 PPM)
Space Frequency: .... 1800 Hz (Deviation: ±200 PPM)
Code Transmission Speed: .... 1200 bits/ second (Deviation: ±200 PPM)

CD-10 Call Sign Display

The CD-10 stores the call sign of calling station in its memory and displays it on an LCD display.
Call signs of up to 20 of the most recently calling stations are stored, allowing the operator to quickly check for and return any call.



CD-10 Block Diagram

[Features]

DCS Decoding

Decodes the digital ASCII call sign data that is a portion of the DCS data string.

CMOS 8-bit Microprocessor

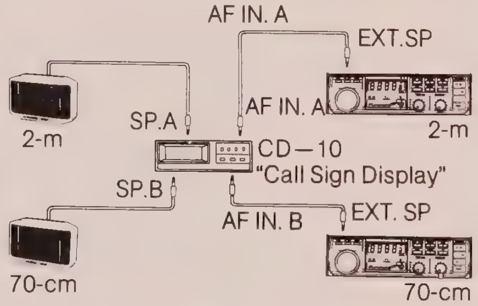
The microprocessor analyzes the call sign data transmitted from the DCS, corrects any data errors due to noise, etc., and displays the incoming call sign in alpha-numeric characters. The microprocessor also controls various switching and memory functions, etc.

Two Speaker Inputs

Two speaker input jacks are provided so that the display may be connected to more than one receiver at a time. Speaker selection is provided by a front panel switch.

Compatible with non DCS receivers

The CD-10 may be used with transceivers that are not equipped for DCS decoding.



Two Speaker input

LCD Display with 6-digit 5 × 7 Dot-matrix

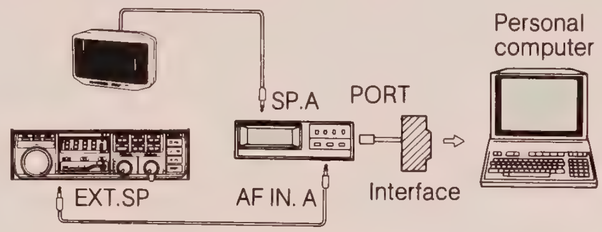
The high visibility display provides a variety of information in addition to the 6 digit call sign.

Memory Function

Up to 20 different call signs may be stored in the resident memory. Memory backup is provided by a built-in Lithium battery.

Computer Output Port

A computer output port is provided for interfacing to a personal computer. This port supplies call sign, and memory data in the form of serial output data. This handy function will allow automatic logging, etc.



Computer output port

[Option]

AC-10: AC Adaptor

[SPECIFICATIONS]

Input voltage....... AC 120/220/240 V
Frequency response......... 50/60 Hz
Output voltage .... DC 13.8 V
Output current .... 200 mA

CD-10 SPECIFICATIONS

Power Requirement	: 13.8 VDC ± 15%	Data Output	: Data = TTL level Clock = TTL level Baud Rate = 3600 bit/sec
Operating Temperature	: 0°C — +50°C	Dimensions	: 125 (4.92) W × 40 (1.57) H × 106 (4.17) D mm (inch) (Projections not included)
Input Impedance	: More than 10 kΩ (output open)	Weight	: 250 g (0.55 lbs.) approx.
Output Impedance	: 8 Ω (input 8 Ω load)		
Input Voltage Range	: 0.1—4 V (output 8 Ω load)		
Input Signal Frequency	: Mark 1200 Hz : Space 1800 Hz : Baud Rate 1200 bit/sec		

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NS		AMSAT - DEUTSCHLAND C/O ALEXANDER SCHOENING, DC7AS LUDOLFINGERWEG, 52	1 BERLIN 28 FEDERAL REPUBLIC OF GERMANY	HOME: 030-401-4411
MG-MS	WA3FUJ	DEVILBISS, JIM AWARDS MANAGER 915 PINE AVENUE	FREDERICK, MD 21701	HOME: (301)662-5784
CA, DV, MG-MS	N5AHD	DIERSING, ROBERT AMSAT BB SYSTEM MANAGER 4129 MONTEGO STREET	CORPUS CHRISTI, TX 78411	HOME: (512)852-3196 WORK: (512)991-6810 X476

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
NT	W6ELT	DILLON, GEORGE 9850 GARFIELD STREET SPACE #134	HUNTINGTON BEACH, CA 92646	HOME: (714)968-7633
MG-SC, UC, P3-OP, OF	WH6AMX	DITTMER, RICK ASST VP S/C OPERATIONS 7305 D ALOALO STREET	HONOLULU, HI 96818	HOME: (808)422-5691 WORK: (808)449-1150 TELEMAIL: RDITTMER
UC	W4DWN	DIXON, WALTER 820 NE 123 STREET MIAMI, FL 33161		HOME: (305)895-0398
NC	PY7CPK	DO O', EDMILSON R. CAIXA POSTAL 427 58100 CAMPINA GRANDE	PARAIBA BRAZIL	HOME: (083)321-1941 WORK: (083)321-2679
AS-UC	KA5DNP	DOUGLAS, JACK 2019 WILLOW POINT DRIVE KINGWOOD, TX 77339		HOME: (713)358-5172
P3-TM, FA	W1HDX	DUBOIS, JOHN 873 HILL ROAD BOXBOROUGH, MA 01719		HOME: (617)263-3192 HOME: (617)263-7004
MG-NT	W8QQW	DUDLEY, WRAY AMSAT NET MANAGER PO BOX 1521	TUBAC, AZ 85646	HOME: (602)398-9380
P3-TM	W0PN	DUNBAR, RON PO BOX 'D' SEDALIA, NC 27342		TELEMAIL: RDUNBAR
UC	K7SFN	DZUIRDA, FRANK 225 WEST COYOTE DRIVE CARSON CITY, NV 89701		HOME: (702)849-1801 WORK: (702)789-6043
MG-EG	N4AZI	EANES, DAVID C. A. S. E. C. S. 4866 DRUSILLA LANE	BATON ROUGE, LA 70809	HOME: (504)923-3442 WORK: (504)293-2201
PC-DV	WB9FLW	EATON, PETER 35 NORSPUR RT-4 EDWARDSVILLE, IL 62025		HOME: (618)288-5432 TELEMAIL: PEATON
UC	K0QQ	EKBLAD, ART 1210 7TH STREET SW MINOT, ND 58701		HOME: (701)852-4289 WORK: (701)852-0555
AS-UC	KA0OOQ	ELDER, JERRY 3213 FOX HILL ROAD ST. CHARLES, MO 63301		HOME: (314)723-8112 WORK: (314)925-6029
AS-UC	KA8TSR	ELLISON, JOHN #3 BERSON AVENUE WHEELING, WV 26003		HOME: (304)232-2667

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
ED		ENSIGN, RICHARD AMSAT SCIENCE ASVISOR 421 NORTH MILITARY	DEARBORN, MI 48124	HOME: (313)274-1718
P3-DV,EQ	WB0WEB	ERNST, STEVE MODE S 207 ELMWOOD DRIVE	COLORADO SPRINGS, CO 80907	HOME: (303)598-5068 WORK: (303)593-8700 X375
NC	KV4AD	FAGEOL, BERT BOX #2126 ST. THOMAS	VIRGIN ISLANDS 00801	HOME: (809)774-0358
CA	KL7QRF	FAIL, JOHN 6170 DOWNEY AVENUE LONG BEACH, CA 90805		HOME: (213)531-4852
OF,MS	KB4ZJ	FELLER, ARTHUR TREASURER 6511 TUCKER AVENUE	MCLEAN, VA 22101	HOME: (703)827-8211 WORK: (202)653-8531
AS-UC	WB4URU	FITZ, HENRY 3354 KEGLER DRIVE JACKSONVILLE, FL 32216		HOME: (904)737-3569 WORK: (904)396-0141
UC	WB0RLY	FLASKA, JOSEPH PHASE III TEAM MEMBER 10535 WEST 26TH AVENUE	DENVER, CO 80215	HOME: (303)238-3274
NC	LU9MA	FONTANA, EUGENIO C. PATRICIAS MENDOCINA 262 5529 RODEO EL MEDIO	MENDOZA ARGENTINA	HOME: F. L. BELTRAN, MENDOZA, 49
UC	WB6GFJ	FORBES, ROSS PO BOX #1 LOS ALTOS, CA 94022		HOME: (415)948-5000 WORK: (415)948-5193
AS-UC	WD4PQN	FORTE, ALFRED 9302 SPRING TERRACE OCALA, FL 32672		HOME: (904)687-1518 WORK: (904)732-0711
P3-TM	W0LER	FOX, JOHN 321 109TH LANE NW COON RAPIDS, MN 55433		HOME: (612)757-3115 WORK: (612)482-2313
NS		AMSAT - FRANCE C/O GERARD FRANCON, F6BEG 69 RUE BATAILLE	69008 LYON FRANCE	
UC	N5BXP	FUGLAAR, HAL 2034 HAMILTON ROSENBERG, TX 77471		HOME: (713)342-4610 WORK: (713)957-7524
NC	DU6EQ	GARCIA, DR. EDUARDO J. 31 LACSON STREET BACOLOD CITY	PHILLIPINES, 600001 THE PHILLIPINES	HOME: 2-44-22 WORK: 2-14-12

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
NC		GENTIL, MARC 3 RUELLE D'ARMORIQUE 78200 MAGANNVILLE	FRANCE	
P3-DV,EQ	WB0BTY	GEORGE, HARRY WIRING HARNESS 8460 MUSTANG PLACE	COLORADO SPRINGS, CO 80908	HOME: (303)495-4051 WORK: (303)576-1363
NC	ZP9AY	GODEFROID, ROBERT CAPITAN MIRANDA RUTA 6 ITAPUA	PARAGUAY	
NC	ON5JM	GOOVAERTS, WILLY MECHELSESTEENWEG 472 EDEGEM	ANTWERP B-2520 BELGIUM	
MG-SC,MG-NC	G3IOR	GOWEN, PATRICK J A 17 HEATH CRESCENT HELLESDON, NORWICH	NORFOLK, NR6 6XD ENGLAND	HOME: 44-60-340-2554
SP	F8ZS	GRUAU, JEAN INSPECTOR GENERAL CNES IMMUEBLE HELIOS	RUE CH. BAUDELAIRE 9100 EVRY FRANCE	HOME: 33-(3) 071-5104 TELEX: A690701F (ATTN:D G/IG-J. GRUAU)
P3-DV,EQ	N0FVQ	GRETX, WARREN PHOTO SUPPORT 3664 EAST LAKE DRIVE	LITTLETON, CO 80121	HOME: (303)770-3811 WORK: (303)231-1881
NC,P3-DV,P3-BN	HA5WH	GSCHWINDT, DR. ANDRAS TECH UNIV OF BUDAPEST (HG5BME) EGRI J.16 H-111	BUDAPEST HUNGARY	WORK: (1)869-231 TELEX: 861-225-931
AS-UC	WB6LLO	GUIMONT, DAVID 5030 JULT STREET SAN DIEGO, CA 92110		HOME: (619)275-2738
NC,P3-BN	KP4AA	GUTIERREZ, CARLOS PO BOX 730 PUEBLO STATION	CAROLINA PUERTO RICO 00628	HOME: (809)752-6938 WORK: (809)791-2805
NS		HAMSAT BOX 882 5600 AW EINDHOVEN	THE NETHERLANDS	
NC	OE1HAB	HANN, HANS PO BOX 16 A 1164, VIENNA	AUSTRIA	
P3-DV,P3-CM,P3-TM,P4-DV	KE3D/ZS1FE	HARDMAN, GORDON 3994 PROMONTORY COURT BOULDER, CO 80302		HOME: (303)449-8461 WORK: (303)442-8866 TELEMAIL: GHARDMAN
P3-DV,EQ	WA6KYI	HAYS, NEIL PARTS PROCUREMENT 736 EAST 18TH AVENUE	DENVER, CO 80203	HOME: (303)832-2439 WORK: (303)832-2439

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
P3-DV,EQ	N0EDJ	HENRISLY, REGINA CONSTRUCTION USGS STOP 966, BOX 25046	DENVER, CO 80225	HOME: (303)469-1293 WORK: (303)236-1636
RP	WA5FXE	HICKEY, WILLIAM PO BOX 912 BOWIE, MD 20715		HOME: (301)464-3994 WORK: (202)282-0298
P3-DV,EQ	KY0S	HILL, CHUCK MODE S 1820 SUMMIT DRIVE	COLORADO SPRINGS, CO 80908	HOME: (303)495-3007 WORK: (303)593-8700 X376
PB	W4PID	HILL, ROY O. 4051 SKYLAND DRIVE KINGSPORT, TN 37664		HOME: (615)246-4515 WORK: (615)229-2721
AR,SP	W6EJJ	HOLLADAY, JAY ASSC CHAIRMAN 5128 JESSEN DRIVE	LA CANADA, CA 91011	HOME: (213)790-1725 WORK: (213)354-7561 TELEMAIL: JHOLLADAY
NC,PB	CE6EZ	HUCKE, RALF CASILLA 145 TEMUCO,	CHILE	HOME: 35983 WORK: 35083 TELEX: 67007 CL
MG-NC,PB, MG-SC	LU4ENQ	HUERTAS, CARLOS CHIEF SO. AMER. AMSAT COORD BOX 9 SUC 1	01401 BUENOS AIRES ARGENTINA	HOME: 54-1-620-1474 WORK: 54-1- 30-5575
SP		INDEPENDENT SPACE RESEARCH GRP (AMATEUR SPACE TELESCOPE PROJ) PO BOX 1246	TROY, NY 10514	WORK: (716)464-0125
NS		AMSAT - ITALIA C/O DOMENICO MARINI, IBCVB VIA A. DE GASPERI - 97	80059 TORRE DEL GRECO (NAPLES) ITALY	HOME: 081-881-8144 WORK: 081-861-2522
NC,PB	PA0DLO	JANSSEN, NICO VUURVLINDERSTRMT-Q5 5641 DL	EINDHOVEN THE NETHERLANDS	
P3-DV,MG- HR	WD4FAB	JANSSON, RICHARD 1130 WILLOWBROOK TRAIL MAITLAND, FL 32751		HOME: (305)644-9008
NS		JAPAN - AMSAT C/O JA1ANG 15-1305 SHIMOUMA : 2-CHOME-26 SETAGAYA-KU	TOKYO 154 JAPAN	
UC	K1FJ/9	JAWORSKI, FRANK 3923 OAKLEAF DRIVE FORT WAYNE, IN 468155421		HOME: (219)484-3222 WORK: (219)429-7943
PC-DV	WA7GXD	JOHNSON, LYLE 3034 N. JACKSON TUCSON, AZ 85719		HOME: (602)574-0809 WORK: (602)746-9127

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
P3-CA	N5KR	JOHNSTON, WILLIAM 1808 POMONA DRIVE LAS CRUCES, NM 88001		HOME: (505)522-2042 WORK: (505)678-5712
UC	W4DAQ	JORDAN, WILLIAM (MACK) PO BOX 1027 DEMOPOLIS, AL 36732		HOME: (205)289-1225
P3-DV,P3-1M,OF,EQ	KA9Q	KARN, PHILIP ASST VP ENG & SYSTEMS ANALYSIS 25-B HILLCREST RD	WARREN ,NJ 07060	HOME: (201)561-2970 WORK: (201)829-4299 TELEMAIL: PKARN
PB,P3-TM	Q3ZCZ/4X	KASSER, JOE RAMOT 976 JERUSALEM	ISRAEL	HOME: 972-2-886-971 WORK: 972-2-810-827
PC-DV	WA3ZIA	KAYSER, LARRY 85 HELENA AVENUE OTTOWA, ONT K1Y3M9	CANADA	HOME: (613)729-7992 WORK: (613)239-2089 TELEMAIL VIA H. MAGNUSKI
AS-UC	NZ4Q	KEARNEY, TIMOTHY 6421 WAYOTA COURT FORT WAYNE, IN 46815		HOME: (219)485-9651 WORK: (219)429-7392
P3-DV,EQ	WD5IBS	KELLY, CHRIS BATTERY TESTING 1220 EAST STUART #14	FT. COLLINS, CO 80525	HOME: (303)493-6136 WORK: (303)667-5000
UC	N8ETY	KIFER, DAVID 3717 WOODWAY AVENUE PARMA, OH 44134		HOME: (216)459-0676 WORK: (216)676-8300 x348
P3-DV,DR,P4-DV,OF,EQ	W3GEY	KING, JAN VICE PRESIDENT - ENGINEERING 7328 ISLAND CIRCLE	BOULDER, CO 80301	HOME: (303)530-9340 WORK: (303)442-8866 TELEMAIL: JKING
NC	OH2XN	KINNUNEN, OLLI S. ALAKARTANONTIE 6B49 SF 02360 ESPOO	FINLAND	HOME: 358-0-801-6583 TELEX: 121394 TLTX SF ATTN: PRIMELEC
FA	KA5EIM	KLETT, TAYLOR ROUTE 1 BOX 421-B	HUNTSVILLE, TX 77340	HOME: (409)295-3517 WORK: (409)294-1075
AR,ED	WB2TRN	KLUGER, LEO C/O ARRL 225 MAIN STREET	NEWINGTON, CT 06111	WORK: (203)666-1541
UC	WB8ZTV	KNOLLINGER, D. E. RD 4 BOX 230 MOUNDSVILLE, WV 26041		HOME: (304)845-1301 WORK: (304)843-1310 X281

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
UC	K8MU	KOZIEL, LAWRENCE 42509 PARKHURST PLYMOUTH, MI 48170		HOME: (313)420-0786 WORK: (313)477-3900
P3-SP,P4-SP,PC-SP		L5 SOCIETY 1060 EAST ELM TUCSON, AZ 85719		WORK: (602)622-6351
MS	N1CHM	LARSON, THOMAS AMSAT VIDEOTAPE LIBRARIAN 85 MAIN STREET	DOVER, MA 02030	
AS-UC	N5EAR	LASKER, MICHAEL 6106 HOWLAND COURT HOUSTON, TX 77084		HOME: (713)550-3106
UC	WOCA	LAUB, NICK 3951 VOORNE STREET SARASOTA, FL 33580		HOME: (813)355-4824 (WINTER HOME)
UC	WOCA	LAUB, NICK RFD #1 BACKUS, MN 56435		HOME: (218)947-3501 (SUMMER HOME)
UC,ED	K9PVW	LEARNER II, K O L5 SOCIETY SPACE EDUCATION NET MANAGER	PO BOX 5014 4012 SOUTH HARDEBECK ROAD KOKOMO, IN 46902	HOME: (317)453-2947 WORK: (317)459-7002
UC	K7ZOK	LEARY, HAL 3625 WATER HOLE STREET LAS VEGAS, NV 89130		HOME: (702)645-4527
AS-UC	KL7ETZ	LEWIS, DAVID 309 WACHUSETTS SITKA, AK 99835		HOME: (907)747-6948 WORK: (907)747-8680
UC	WA9PZL	LEY, ROGER 2514 DEAS BOSSIER CITY, LA 71111		HOME: (318)746-0356
SP	KXOO	LIBBY, LAUREN 6166 DEL PAZ DRIVE COLORADO SPRINGS, CO 80934		HOME: (303)593-9861 WORK: (303)598-1212
NC,PB	XE1TU	LIBERMAN, DAVID BOSQUE, SAYULA 22 MEXICO 10, E DO. DE MEX.	MEXICO	HOME: (905)589-3994 WORK: (905)576-5188 WORK: (905)576-5198
UC	KORL	LILE, RONALD E. 2822 WOODSIDE DRIVE QUINCY, IL 62301		HOME: (217)223-6698 WORK: (217)223-3211 X213
UC	W4BIW	LINDSEY, BYRON 1356 VISTA LEAF DRIVE DECATUR, GA 30033		HOME: (404)636-7452

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
NC	EA3LL	LLAGOSTERA, JOSE M. APT #310 REUS (TARRAGONA)	SPAIN	
UC	K3JL	LOW, JOHN ROUTE 2 - BOX 2440 GEORGETOWN, DE 19947		HOME: (302)856-2307 WORK: (302)629-1150
UC	W7KMF	MABBOTT, LYLE PO BOX 618 DUBOIS, WY 82513		HOME: (307)455-2956
PB	WA5ZIB	MACALLISTER, ANDY AMSAT MANAGEMENT LETTER EDITOR 2310 ROMAYOR COURT	PEARLAND, TX 77581	HOME: (713)485-9747 WORK: (713)972-6403
OF, OP, MK, MS, AD	N6ARE	MACASSEY, JULIAN L. ACTING VP - OPERATIONS 475 NORTH DAISY AVENUE	PASADENA, CA 91107	HOME: (818)449-7088 WORK: (818)449-7088 TELEMAIL: JMACASSEY
MG-SC	KA6M	MAGNUSKI, HANK AMICON SSC COORDINATOR 311 STANFORD AVENUE	MENLO PARK, CA 94025	HOME: (415)854-1927 WORK: (415)856-7421
UC	WB2LEI/4	MALIN, JERRY 709 MADRAS LANE CHARLOTTE, NC 28211		HOME: (704)364-1635 WORK: (704)584-6188
P3-DV, EQ	WOVN	MANKUS, CHARLEY MODE S 9675 MORGAN ROAD	COLORADO SPRINGS, CO 80908	HOME: (303)495-4060 WORK: (303)577-8197
AS-UC	WA8RYD	MARCHAL, JEROME 270 WEST SHARON ROAD CINCINNATI, OH 45246		HOME: (513)772-0724 WORK: (513)733-6827
NC, PB	I8CVS	MARINI, DOMENICO VIA A. DE GASPERI 97 80059 TORRE DEL GRECO	NAPLES ITALY	HOME: (081)881-8144 WORK: (081)861-2522
UC	W6KAQ	MASON, M. A. SSC COORDINATOR 5 BRIDLE LANE	RANCHO PALOS VERDES, CA 90274	HOME: (213)831-4905
UC	W4FJ	MATHEWSON, TED 1525 SUNSET LANE RICHMOND, VA 23221		HOME: (804)355-5118 WORK: (804)355-5118
P3-CA, NT, P3-DV	KORZ	McCAA, JR., WILLIAM PO BOX #3214 BOULDER, CO 80607		HOME: (303)499-1936
MG-CA, AS-UC	N4HY	Mc GWIER, ROBERT AMSAT SOFTWARE EXCHANGE MGR 917 MCKINLEY AVENUE	AUBURN, AL 36830	HOME: (205)821-6758 WORK: (205)826-4290

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
NT, UC, OF, OP, AD	W0CY	MC KIM, JIM ASST VP OF ADMINISTRATION 1404 SOUTH 10TH STREET	SALINA, KS 67401	HOME: (913)827-2927
P3-DV, EQ	NF0U	McROBERTS, DUFF BATTERY TESTING 1308 ELLEN PLACE	LOVELAND, CO 80537	HOME: (303)669-3708 WORK: (303)667-5000
UC, MS	W0VO	MEANS, EDWARD SOLAR CELL CERTIFICATES 212 NORTH FARRAGUT	COLORADO SPRINGS, CO 80909	HOME: (303)473-6174
P3-DV, P3-CM, P3-TM	DJ4ZC	MEINZER, KARL AN DEN BRUNNENROHREN D-3550 MARBURG	HESSEN FEDERAL REPUBLIC OF GERMANY	HOME: 011-49-6421-64480 WORK: 011-49-6421-283550 TELEX: 841-482-372
ED	W2GN	MERRY, FRED 35 HIGHLAND DRIVE EAST GREENBUSH, NY 12061		HOME: (518)477-4990
NS		AMSAT - MEXICO C/O DAVID LIBERMAN, XE1TU BOSQUE, DE SAYULA, 22	MEXICO 10, DF MEXICO	
UC	WA5WHN	MILLER, JAY D. 4613 JUPITER N.W. ALBUQUERQUE, NM 87107		HOME: (505)344-6734 WORK: (505)345-3311 X3103
NC	VU2IJ	MISTRY, JIMMY H. NORMUS - 16 PERRYCROSS RD BANDRA	BOMBAY, 400050 INDIA	
UC	WA8LAJ	MOORE, GERALD W. 114 ST. FRANCIS AVENUE TIFFIN, OH 44883		HOME: (419)447-6719 WORK: (419)447-6331
NC	YV5ZZ	MUELLER, EDGAR APARTADO 76093 CARACAS, 107	VENEZUELA	
AS-UC	KB4AKQ	MYERS, ROBERT 346 PARKDALE DRIVE CHARLESTON, SC 29407		HOME: (803)556-5022 WORK: (803)743-4542
P3-TM, CA, JS-DV	JR1SWB	NAKAYAMA, MIKI 3-9-14 HIGASHINAKANO NAKANO - KU	TOKYO 164 JAPAN	HOME: 03-371-2676 TELEMAIL: MNAKAYAMA
NS		AMSAT - NEDERLAND C/O J P VAN DER FLUIT, PA0KTF GROENSVOORDE 148	WADDINXVEEN THE NETHERLANDS	
AS-UC	W4EEE	NORTON, GEORGE F. 250 MILLEDGE TERRACE ATHENS, GA 30606		HOME: (404)543-3572

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
P3-DV,EG	W1XE	NOYES, GEORGE MODE S PO BOX 3236	BOULDER, CO 80307	HOME: (303)642-3128 WORK: (303)776-5521
SP	JA2PKI/W6	OKAMOTA, TAC 191 PINESTONE IRVINE, CA 92714		HOME: (714)857-0505 WORK: (714)678-0417
NC	TG9SO	OLIVOTTO, ROBERTO S. PO BOX 144-A CIUDAD DE GUATAMALA	GUATAMALA	HOME: (2)65363 WORK: (2)913723 WORK: (2)912147
UC	VE3HCR	OMAN, DAVID 330 WINIFRED DRIVE KESWICK	ONTARIO, L4P 3B5 CANADA	HOME: (416)476-5973 WORK: (416)476-4321 WORK: (416)476-2000
NC	OK3AU	ORAVEC, ANDRE J. UL SLOBODY 31 KOSICE 04011	CZECHOSLOVAKIA	HOME: 095-420-304
UC	W6IFW/O	OWENS, LEE 1205 SOUTH 5TH STREET ATCHISON, KS 66002		HOME: (913)367-4226
NC	5B4KP	PANDEHIS, CHARLES PO BOX #1152 NICOSIA,	CYPRUS	
UO-PB	WA4SIR	PARISE, RONALD 15419 GOOD HOPE ROAD SILVER SPRING, MD 20904		HOME: (301)384-0250 WORK: (301)344-8874
UC	N5ARS	PARRIS, WILLIAM 4801 SOUTH 96TH STREET FORT SMITH, AR 72915		HOME: (501)452-1689 WORK: (501)646-4711 X450
NC	9J2KL	PATEL, KANUBHAI PO BOX #30233 LUSAKA	ZAMBIA	HOME: 254045 WORK: 214282 TELEX: ZA 42421 "CAPCO"
P3-CA,PB	W2GFF	PEACOCK, RICHARD 9 ANDREA DRIVE SETAUKET, NY 11733		HOME: (516)941-4943 WORK: (516)595-4897
MS	KA1DF	PEARSE, GEORGE B. 84 BRIGHAM HILL ROAD GRAFTON, MA 01519		HOME: (617)839-2933 WORK: (617)376-2947 TELEX: 5106002227
NC	LU8DYF	PENINI, NORBERTO PACHECO 3346 01636 OLIVOS	ARGENTINA	WORK: 54-1-795-4685
LA	W8GQ	PETERSON, KEVIN R. 5657 THORNY ASH ROCHESTER, MI 48063		HOME: (313)765-8114 WORK: (313)972-7982

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
UC	KI7L	PETERSON, STEPHEN 3791 SOUTH 1860 EAST SALT LAKE CITY, UT 84106		HOME: (801)278-2727
P3-TM	KBONR	PHILSTROM, RICHARD 61 NE 90TH LANE BLAINE, MN 55434		
AR,ED,PB	WB1EYI	PLACE, STEPHEN C/O ARRL 225 MAIN STREET	NEWINGTON, CT 06111	HOME: (203)667-8955 WORK: (203)666-1541
SP,UC	W1NU	POLITI, VIC 69 FLAX ROAD FAIRFIELD, CT 06430		HOME: (203)259-4655
UC	WD4HWO	POWER, BRUCE 1321 NANCY DRIVE TALLAHASSEE, FL 32301		HOME: (904)877-3635 WORK: (904)488-4318
UC	W1IAS	POWER, TED 40 MASSACHUSETTS COURT FALMOUTH, MA 02540		WORK: (617)548-1611
PC-EQ,OF	NK6K	PRICE, HAROLD E. ASST VP - ENGINEERING 1211 FORD AVENUE	REDONDO BEACH, CA 90278	HOME: (213)376-3147 TELEMAIL: HPRICE
PB,CA,SP, MS		PROJECT OSCAR, INC. PO BOX # 1136 LOS ALTOS, CA 94022		
AS-UC	W5IU	PUGH, KEITH PO BOX 12492 FORT WORTH, TX 76116		HOME: (817)292-5633 WORK: (817)777-4484
MS	WA3DMF	RADER, WALT QSL & LISTENER REPORTS 3702 ALLISON STREET	BRENTWOOD, MD 20722	HOME: (301)864-2398
AS-UC	WB9ANQ	RAHN, BRUCE A. 410 CORANADO TRAIL ENON, OH 45323		HOME: (513)864-5803 WORK: (513)259-4028
PC-DV	WDOETZ/5	REED, WILLIAM 3110 AFTON DRIVE CARROLLTOWN, TX 75007		HOME: (214)492-7508 WORK: (214)830-7735 TELEMAIL: WREED
AS-UC	KT5U	REEVE, RUSTY ROUTE 2 - BOX 211-0 MCKINNEY, TX 75069		HOME: (214)442-1217 WORK: (214)995-4414
UC	VE6AK	REID, GORDON PO BOX #11721 EDMONTON	ALBERTA T5J 3K8 CANADA	

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
P3-TM	W6PAJ	REYMANN, SKIP PO BOX 374 SAN DIMAS, CA 91773		HOME: (714)599-3936
NC	9M2CR	RICHARDS, COLIN 73 JALAN PANTAI PORT DICKSON	MALAYSIA	HOME: 06-791-834
OF, DR, PB, NT, AD	WA2LQQ	RIPORTELLA, VERN PRESIDENT PO BOX 177	WARWICK, NY 10990	HOME: (914)986-6904 WORK: (201)284-2352
P3-DV, EQ	K6PQT	RITCHIE, DON SOLAR ENVIRONMENTAL RESEARCH 14855 WEST 54TH AVENUE	GOLDEN, CO 80403	WORK: (303)231-1373
PB, CA	ZS1BI	ROBERTS, GREG PO BOX 9 OBSERVATORY, 7935	SOUTH AFRICA	HOME: 537124 WORK: 551341 TELEX: 906-57-20309
UC	W9MXC	ROBERTS, LARRY H. 3300 FERNWOOD ALTON, IL 62002		HOME: (618)465-2735 WORK: (314)233-4370
NC	VK3ACR	ROBINSON, CHARLES J. 338 DORSET STREET BORONIA	VICTORIA 3155 AUSTRALIA	
AS-UC	KQ6LC	ROEMER, PAUL Q. 90 LEE AVENUE MANCHESTER, NH 03103		HOME: (603)623-7613
SP	W8JLE	ROGERS, ROBERT M. 1587 SUSSEX ROAD TROY, OH 45375		HOME: (513)339-1041
AS-UC	KOBI	ROOP, JAMES PO BOX 255 ALLEGAN, MI 49010		HOME: (616)673-2093 WORK: (616)603-2063
UC	K1DS	ROSEN, RICK 321 TABER AVENUE PROVIDENCE, RI 02906		HOME: (401)272-5626 WORK: (401)331-3000
AS-UC	WA6YBT	ROSENBERG, ERIC PO BOX 15636 HARRISBURG, PA 17105		WORK: (717)236-6000 X268
FA	K4YV	ROSNER, ROY 12001 TURF LANE RESTON, VA 22091		HOME: (703)860-1389 WORK: (703)689-6537
NC, CM, TM	ZL1WB	ROWLINGS, BRUCE 6 MASON STREET ONERAHI	WHANGAREI, NORTHLAND NEW ZEALAND	HOME: 61312 WORK: 81299

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
NC	TI2NA	ROY, ERIC BOX #661 SAN JOSE,	COSTA RICA	
UC	W7RZY	ROYLANCE, HARRY 216 SOUTH M STREET LIVINGSTON, MT 59047		HOME: (406)222-0655 WORK: (406)222-0655
UC	WD5GLD	RUHL, RICHARD PO BOX 539 KINGFISHER, OK 73750		HOME: (405)375-4843 WORK: (405)375-4111
UC	W3KH	RUPERTO, E. F. (BUCK) RD 1, BOX 366 WEST ALEXANDER, PA 15376		HOME: (412)663-5004
AM, MG-AD, MS, CA		SARAGOVITZ, MARTHA CORPORATE SECRETARY 9620 SUTHERLAND ROAD	SILVER SPRING, MD 20901	HOME: (301)589-7380 WORK: (301)589-6062
UC	NOAN	SCHIERS, HASAN A. PO BOX 171 AMES, IA 50010		HOME: (515)434-2368 WORK: (515)232-8405
AS-UC	WB8IFM	SCHRICK, GERD 4741 HARLOU DRIVE DAYTON, OH 45432		HOME: (513)253-3993
UC	W9JUV	SCHROEDER, JOSEPH BOX #406 GLENVIEW, IL 60025		HOME: (312)724-8831 WORK: (312)394-3380
NT, UC	W6CG	SCHULTZ, BUD 3050 WEST BALL RD #154 ANAHEIM, CA 92804		HOME: (714)826-4850
AS-UC	KL7JHX	SEARLES, HARRY BOX 585 VALDEZ, AK 99686		HOME: (907)835-2347 WORK: (907)835-2415
UC	W4AUZ	SHEPHERD, WILLIAM R. 325 TAYLOR DRIVE LEXINGTON, KY 40505		HOME: (606)254-4228 WORK: (606)254-8542
NC	SM5KUX	SKARSFELL, SIGGE BOX 27 S-601 03 NORRKOPING	SWEDEN	
P3-TM	WD0EEL/4	SKOOG, JAMES 1265 NW 7TH STREET BOCA RATON, FL 33432		HOME: (305)395-4575 WORK: (305)994-8800 X3334
P3-CM, P3-TM	VE1SAT	SMITH, RANDALL BOX 2194 MEDLEY,	ALBERTA TOA 2M0 CANADA	HOME: (403)594-6446 WORK: (403)594-8870

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
UC	KW2U	SODERMAN, ROGER E. 43 COUNTRY SQUIRE ROAD OLD TAPPAN, NJ 07675		HOME: (201)666-2870
FA,NT	W2RS	SOIFER, RAPHAEL 60 WALDRON AVENUE GLEN ROCK, NJ 07452		HOME: (201)447-5472 WORK: (212)483-5508
NC	YO2IS	SOLI, IULIUS STR. IASI 1 1900 TIMISOARA	ROMANIA	HOME: (961)37981 WORK: (961)13237
PB,OF,PR	WA6VOS	SOMERS, JACK ASST VP - PUBLIC AFFAIRS/DEV. PO BOX #49751	LOS ANGELES, CA 90049	HOME: (213)478-1717 WORK: (213)820-1234 WORK: (800)421-6631
UC	VE2ASL	SONDACK, ROBERT 260 BELLERIVE ST. LUC	QUEBEC JOJ 2A0 CANADA	HOME: (514)348-9425 WORK: (514)347-5301
NS		AMSAT - SOUTH AFRICA C/O HANS VAN DE GROENENDAAL PO BOX 13273	NORTH MEAD, 1511 SOUTH AFRICA	
P3-MG-ED	ZL1MO	SPACKMAN, IRVING 78 WAIMA CRESCENT TITIRANGI CRESCENT	NEW ZEALAND	
AS-UC	AA7A	STEARNS, EDWARD 7038 EAST ASTOR DRIVE SCOTTSDALE, AZ 85254		HOME: (602)948-5080 WORK: (602)949-2738
UC	N5BRQ	STRICKLIN, ROBERT S. 2225 ARBOR CREST CARROLLTON, TX 75007		HOME: (214)442-4218
AS-UC	WA6HBV	STRONG, JUDD B. 185 SALINAS DRIVE VACAVILLE, CA 95688		HOME: (707)446-4748
NC	VU2UV	SUBRAMANIAN, GP CAPT V LRDE, HIGH GROUNDS BANGALORE 1	INDIA 560001	WORK: 27226 TELEX: 084 5288
NC	SP9DH	SUCHETE, ADAM SKR. POCZT 73 32-065 KRZESZOWICE	POLAND	HOME: 210-71
UC	W7FF	SWAFFORD, JAMES 5906 WEST MIRAMAR DRIVE TUCSON, AZ 85715		HOME: (602)298-7793
SP	KA1FCP	SWANSON, ARTHUR 14 WYMAN ROAD CAMBRIDGE, MA 02138		HOME: (617)492-5231

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
AR, SP	K1ZZ	SUMNER, DAVID C/O ARRL 225 MAIN STREET	NEWINGTON, CT 06111	WORK: (203)666-1541
UO-CM, UO- MG-OP, PC- DV	G3YJO	SWEETING, MARTIN DEPT OF ELECTRICAL ENGINEERING UNIVERSITY OF SURREY	GUILDFORD SURREY GU2 5XH ENGLAND	TELEX: 851-859-331 WORK: 011-44-48-37-1281 X755
UC	VE1KQ	SZPILFOGEL, SERGE PO BOX #25 ARMDALE HALIFAX	NOVA SCOTIA CANADA	
PC-SP		- TAPR - TUCSON AMATEUR PACKET RADIO PO BOX 22888	TUCSON, AZ 85734	WORK: (602)746-1166
UC	N8DOD	TEEPLE, JAMES 1230 WARD NW WARREN, OH 44485		HOME: (216)399-7292
NC	LZ1AB	TERZIEV, VASSIL PO BOX 311 SOFIA	BULGARIA	
AS-UC	N8AEQ	TESSNEER, KENNETH 4575 ARROWHEAD TRAIL ENON, ON 45323		HOME: (513)864-1156
AS-UC	NC5Y	TEW, GEORGE 1209 SPRINGDALE DRIVE JACKSON, MS 39211		HOME: (601)956-4724
AS-UC	KN5D	THANNISH, ROBERT PO BOX 997 CORRALES, NM 87048		HOME: (505)898-3859
AR	WB1DNL	TOWLE, JOHN SATELLITE PROJECTS REP C/O ARRL	225 MAIN STREET NEWINGTON, CT 06111	
NC	OD5GR	TRAD, GEORGE TRAD BUILDING SURSOCK STREET	TABARIS BEIRUT LEBANON	HOME: 337-012
UC	WA2LJM	TRAVER, RAMON 48 CARROLL STREET POUGHKEEPSIE, NY 12601		HOME: (914)454-3249
SS-SP, RP, MF-SP, OF	W3XO/W3KMV	TYNAN, WILLIAM VP - MANNED SPACEFLIGHT 13620COLEFAIR DRIVE	SILVER SPRING, MD 20904	HOME: (301)384-9138 WORK: (301)953-5083 TELEMAIL: BTYNAN
NS		AMSAT - UK C/O RON BROADBENT, G3AAJ 94 HERONGATE ROAD	WANSTEAD PARK LONDON E12 5EQ ENGLAND	HOME: 011-44-989-6741

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
P3-DV, EQ	AAOL	UBERECKEN, RAY MODE S 9635 THOROUGHBRED LANE	COLORADO SPRINGS, CO 80908	HOME: (303)495-3544 WORK: (303)590-2189
NC	PAOKTF	VAN DER FLUIT, J. P. GROENSVOORDE 148 WADDINXVEEN	THE NETHERLANDS	
NC	SV1AB	VERNARDAKIS, GEORGE 7 ANDIXEOS STREET NEA KIFISIA	ATHENS GREECE	HOME: 8015750 WORK: 5711128
NC	4X4MH	VILENSKY, DR. ALEX PO BOX #6342 HAIFA	ISRAEL	HOME: 04-332303 WORK: 04-533111 X210
PC-SP		- VITA - VOLUNTEERS IN TECH. ASSISTANCE ATTN: GARY GARRIOT, WA9FMQ	1815 NORTH LYNN STREET ARLINGTON, VA	WORK: (703)276-1800
NC	HB9OP	VOGEL, TED CH. DU LEMAN, PREVALLON CH. 1297 FOUNEX	SWITZERLAND	HOME: (022)764242
UC	K1LJL	WARLEY, STEPHEN 63 MOORE DRIVE BURLINGTON, VT 05401		HOME: (802)658-3679
P3-CA, UC	WOSL	WELCH, ROY D. 908 DUTCH MILL DRIVE MANCHESTER, MO 63011		HOME: (314)391-1127 WORK: (314)235-1845
AS-UC	W4KDP	WHITEHURST, ROBERT 25 ARCADIA TUSCALOOSA, AL 35401		HOME: (205)553-1282
NS		WIA - PROJECT AUSTRALIS C/O DAVID HULL, VK3ZDH 3 OLIPHANT COURT	MULGRAVE 3170, VICTORIA AUSTRALIA	HOME: 011-61-3-560-9194 WORK: 011-61-3-524-2257
TM	K9CIS	WIESENMEYER, FRANK 2181 SUMMIT COURT DECATUR, IL 62526		HOME: (217)428-9865
UC	VE5XU	WIGHTMAN, GORDON 3637 VICTORIA AVENUE REGINA	SASKATCHEWAN S4T 1M4 CANADA	HOME: (306)352-0306
SP	K3NW	WILLIAMS, NORMAN RFD 4 BOX 411 FLEETWOOD, PA 19522		HOME: (215)944-0101 WORK: (215)921-6527
P3-DV, EQ	WAOVSL	WILSON, DOUG PHASE III TEAM MEMBER 15980 ROLLERCOASTER ROAD	BOULDER, CO 80303	HOME: (303)488-2471

TITLES	CALLSIGN	ADDRESS	ADDRESS	PHONES
CA, MS	WD9ICQ	WIMAN, JAMES PO BOX 338 ASHMORE, IL 61912		HOME: (217)349-8820
PB	KB2M	WINARD, HAROLD AMATEUR SATELLITE JOURNAL ED 30 W UNION TURNPIKE	PO BOX 575 APARTMENT B8 WHARTON, NJ 07885	HOME: (201)361-6478 WORK: (201)393-6295
AS-UC	W7TY	WOERTENDYKE, HOWARD ROUTE 1 - BOX 603 KAMIAH, ID 83536		HOME: (208)935-2361
SP		WORLD SPACE FOUNDATION (SOLAR SAIL PROJECT) PO BOX Y	SOUTH PASDENA, CA 91030	WORK: (213)440-9446
UC	N9HR	WRENSCH, TOM NORTH 7900 HILLCREST STREET OCONOMOWOC, WI 53066		HOME: (414)567-7382 WORK: (414)691-0070 X384
MQ-MS	WB8OTH	YANTIS, PERRY AMSAT QSL BUREAU MANAGER 1850 LISLE	OBETZ, OH 43207	HOME: (614)491-1498
DR, MQ-NC, PB, MQ-SC, JS-DV	JA1ANQ	YONEDA, HARUO 15-1305 SHIMOUMA 2-CHOME-26	SETAGAYA-KU TOKYO 154 JAPAN	HOME: 03-410-2253 WORK: 03-544-5056 TELEX: 781-25-22287 "DENTSU"
NC	OA4BR	ZELLON, JAMES NICOLAS DE RIVERA 890 SAN ISIDRO	LIMA 27 PERU	HOME: 417393 WORK: 677777
UC	WA3QOV	ZISERMAN, HOWARD 2200 BEN FRANKLIN PARKWAY #717 N	PHILADELPHIA, PA 19130	HOME: (215)563-5254
SP	K1HTV	ZWIRKO, RICHARD 12509 RANSOM DRIVE GLENN DALE, MD 20769		HOME: (301)464-2133 WORK: (202)755-4414

Meeting Minutes
Ad Hoc Committee on Amateur Radio Digital Communication
Newington, CT
December 7-8, 1985

1) The Ad Hoc Committee on Amateur Radio Digital Communication met on December 7 and 8, 1985, at ARRL HQ. Present were:

Committee members:

Paul Rinaldo, W4RI (Chairman)
Marshall Quiat, AGØX (Board Liaison)
Terry Fox, WB4JFI
Lyle Johnson, WA7GXD
Wally Linstruth, WA6JPR
Doug Lockhart, VE7APU
Eric Scace, K3NA

Observers:

Phil Karn, KA9Q
Ed Raso, WA2FTC (Gateway Editor)
Gwyn Reedy, W1BEL

2) Paul Rinaldo reported that two Committee members recently had resigned: Den Connors, KD2S, and Paul Newland, AD7I. The Committee regretted their departures and appreciated their past contributions to packet radio.

3) There was general agreement that the current number one problem in packet radio is congestion. This recognizes that 1200 bit/s is already too slow to handle the amount of traffic on a single channel such as 145.01 MHz and that a move to 9600 bit/s for intercity traffic buys us only a year or so. Wally Linstruth led the discussion of congestion-mitigation schemes:

a) Phil Karn circulated a paper, entitled "Alleviating AX.25 Network Congestion," which proposes binary trunkated back off (if there is a collision, double the back-off time). The immediate adoption was discussed then later deferred for further study. Phil plans to present a paper on this subject at the Fifth ARRL Amateur Radio Computer Networking Conference.

b) Congestion could be eased by more channel space, such as using 145.01, .02, .05, .07 and .09 MHz as done in certain areas. A move to higher frequencies where adequate space is available would ease congestion on 145 MHz. Greater intercity trunk capacities are possible using full duplex.

c) An increase in speed to 9600 bit/s and higher is needed. It was noted that use of the K9NG data randomizer was difficult because of frequency drift of the Hamtronics FM-5. It was AGREED that the central problem was lack of suitable "data radios" and that members of the Committee would get the word out to VHF/UHF experimenters that we need their design help. Marshall Quiat, Paul Rinaldo and Eric Scace will contact Rich Rosen, RSGB and Bill Tynan, respectively. A working group consisting of Terry Fox, Lyle Johnson, Wally Linstruth and Doug Lockhart defined the following parameters:

Data Interface Requirements: Received data, transmitted data, X1 receive clock, X1 transmit clock, and data carrier detect. Either TTL or RS-422 levels.

RF Interface Requirements: 28 MHz in and out (to make use of transverters), 10-50 mW clean output, 50 ohms, capable of 56 kbit/s, transmit bandwidth <100 kHz, capable of full duplex.

d) It was AGREED that Terry Fox and Phil Karn will ask Dave Mills, W3HCF, to perform an analysis of the traffic on the WB4JFI-5 digipeater. What is the nature of the congestion? What adjustments are appropriate? Who should make them? A persistence strategies matrix may be needed: eg, network control (shortest delay), keyboard-to-keyboard (short delay), machine-to-machine (long delay), etc.

4) Repeater Directory editor Bart Jahnke, KB9NM, temporarily joined the meeting to discuss listing of digipeaters. There was general agreement that major digipeaters should be listed but a minority preference for simply listing channel assignments in an area. The Committee indicated interest in the ARRL publishing digipeater maps. It was noted that little could be changed in the 1986-1987 Repeater Directory already in preparation, but that ideas for future editions should be sent to Paul Rinaldo.

5) Preparations for the Fifth ARRL Amateur Radio Computer Networking Conference were discussed. It was agreed that the Conference will be held on Sunday, March 9, 1986, from 8 AM to 4:30 PM at the Orlando Hamcation. The Committee meeting is scheduled for Saturday, March 8, at 3 PM. The FADCA/SOUTHNET tutorial and demonstration will take place on Saturday morning. There are two hotel arrangements:

Howard Johnson's Executive Center Hotel - downtown, Rte 50 and I-4, Orlando. Tel: 305-843-8770. Special rates: $36 per night per room (maximum 4 persons per room).

Comfort Inn Downtown, 720 S Orange Blossom Trail (at the East-West Expressway), Orlando. Tel: 305-841-0788. Special rates: $25 per night per room (maximum 4 persons per room).

Mention Orlando Hamcation when making reservations to get these special rates.

(Thanks to Gwyn Reedy, W1BEL, and Dick Jansson, WD4FAB, making local arrangements.)

6) Progress in development of three candidate networking and transport protocols was discussed.

a) TCP/IP Datagram: Phil Karn reviewed TCP/IP architecture. Phil has written code for the following modules:

UDP (0.5 kbytes)
TCP (6 kbytes)
IP (half completed, 10 kbytes?)
SLIP (5 kbytes)

A demonstration of Phil's TCP/IP-based protocols is expected at Orlando.

b) AX.25 Virtual Circuit: Terry Fox reported that Howie Goldstein, N2WX, has written working code. AMRAD is concentrating on the network switch and is writing AX.25 Level 3 and an X.224-based transport protocol in "C" on an IBM PC. AMRAD is using a messaged-oriented operating system called "HUB."

c) AQ.921 Virtual Circuit: Eric Scace made a detailed presentation of a proposed networking protocol based on CCITT Recommendation Q.921, part of the Integrated Services Digital Network (ISDN) suite of protocols.

d) Hardware: Lyle Johnson reported on TAPR development of hardware to support networking development. He showed a prototype network-node controller which uses a Z80 processor, and has 4 HDLC ports and 2 parallel ports.

7) AX.25 Link-Layer Protocol:

a) Terry Fox mentioned that there are some inconsistencies relating to link resets in the AX.25 Level 2 state tables. It was AGREED that Terry will write a proposal for changes and include SDL diagrams (now partially done), and send them to Paul Rinaldo for circulation to the Committee.

b) Phil Karn outlined his ideas for a backwards-compatible multireject and selective-reject procedure. It was AGREED that Terry will consider them with the proposed changes.

c) Paul Rinaldo relayed a request from GLB Electronics for a protocol identifier (PID) to specify TNC status. It was AGREED that Terry will talk to Gil Boelke and report back to the Committee with a proposed PID assignment scheme.

8) The desirability of a protocol verifier was AGREED. No specific action was recommended.

9) More-effective use of DRNET was discussed. Eric Scace introduced an alternative of access to Telenet at no charge for members of the Committee. Eric's letter which gives details of the arrangement is attached.

10) Eric Scace reported his inability to filter out packets on 14.103 MHz when listening to NCDXF beacons on 14.100 MHz. It was AGREED that this question will be raised in Gateway to see if others are experiencing interference and, if so, what the solutions are.

11) Doug Lockhart brought the new VADCG TNC + to show to the group. Preliminary assembly instructions dated Dec 4, 1985 were circulated.

12) Paul Newland, in his letter to the Committee dated November 19, 1985, (attached) said that he was often asked what the Committee does and doesn't do, and asked if there is a charter or mission statement? It was AGREED that the Committee mission would be published in Gateway.

13) Paul Newland, ibid, asked that the Committee consider and make public its position on the desirability of using NRZI in combination with the data randomizers (a la K9NG). The Committee AGREED that NRZI should be used because it is polarization insensitive (unlike NRZ).

14) Paul Newland, ibid, requested that the Committee adopt a standard for radiogram messages for computer traffic systems. The Committee has had a goal to do this since its inception and has previously agreed to study the CCITT X.400 suite. The Committee received from Jack Sanders, NC4E, a copy of a proposed method of handling radiograms based on CCITT X.12. Copies of the documentation and IBM PC diskette were distributed at the meeting. Members of the Committee are requested to evaluate the NC4E proposal and forward comments to Paul Rinaldo.

15) Paul Newland, ibid, asked that the Committee consiser working with the IARU to specify some mutually agreeable characters for those undefined in ITA2. The Committee declined on the basis that there are national reasons why the CCITT decided to leave certain characters undefined.

Respectfully submitted,

Paul L Rinaldo

Paul L. Rinaldo, W4RI
Chairman

THE AMERICAN RADIO RELAY LEAGUE, INC.
INTERNATIONAL SECRETARIAT OF THE INTERNATIONAL AMATEUR RADIO UNION
ADMINISTRATIVE HEADQUARTERS NEWINGTON, CONNECTICUT, U.S.A. 06111

October 25, 1985

To : Ad Hoc Committee on Amateur Radio Digital Communication
Subject: Meeting Notice

There will be a meeting of the digital committee on December 7 and 8, 1985, at ARRL Headquarters.

Agenda items will include:

1) Expediting move to 9600 bauds to relieve congestion.

2) Progress on network and transport protocols, software and hardware. Committee members should be prepared to discuss, among other proposals:

   the literature provided by Phil Karn (MIL-STD-1778, Transmission Control Protocol) being mailed to you separately, and

   the papers from Eric Scace (CCITT Signaling System No. 7), mailed to you earlier.

3) Preparations for Fifth ARRL Amateur Radio Computer Networking Conference.

4) Review draft of AX.3. (I have started on a draft and hope to have it written and distributed before meeting based on Doug Lockhart's paper and comments from Terry Fox.)

5) Consideration of GLB Electronics' PID proposal (being mailed separately).

6) Feasibility of an AX.25 protocol verifier.

7) More-effective digital committee interaction with DRNET.

8) Items for report to ARRL Board Meeting in January 1986.

Please let me know any additional agenda items as soon as possible so I can circulate them and any reference material prior to the meeting.

The below tentative schedule has been arranged to make it possible to come on Saturday morning and leave Sunday evening. Of course, if you wish to spend some time at ARRL Hq on the Friday before or the Monday after, that's fine too.

Saturday, December 7

8:00-12:00	Arrivals
1:00- 5:00	Digital Committee meeting
6:00- 7:00	Buffet dinner (at W4RI's residence)
7:00-10:00	Informal discussion (at W4RI's)

Sunday, December 8

9:00-12:00	Digital Committee meeting
12:00- 1:00	Lunch
1:00- 4:00	Digital Committee meeting
5:00-10:00	Departures

To take advantage of lowest air fares, **please book your airline reservations at least 30 days beforehand.** I will arrange to pick you up at, and/or deliver you to, the airport or AMTRAK station if you will telephone and let me know your arrival and departure information. Two rental cars will be reimbursable out of digital committee funds; if you wish to be one of those two and will share it with others, please let me know when you call with your travel information.

Please book your own reservations at the Super 8 Motel of Hartford (same one we used in October 1984), 57 W Service Rd, just north of Hartford on I-91. Reservation phone numbers are: 800-843-1991 and 203-246-8888. It would be prudent to book your room as soon as you have air reservations to ensure a room.

The ARRL Administration and Finance Committee has first priority on the Hq Conference Room on Saturday, December 7. So, we'll be using the employee's lounge to begin with, then can migrate to the conference room when it goes free.

Please call Hq and let me or Technical Secretary Maty Weinberg know your (1) arrival/departure info, (2) whether you need pickup/dropoff at the airport or train station, (3) whether you want to be one of the two people to rent a car, and (4) any additional agenda items.

73,

Paul

Paul L. Rinaldo, W4RI
Chairman

20	OH1II	7	82
21	OH6UP	6	67
22	OH2BPF	12	62
23	OH2NDM	13	52

Pisin QRB OH3TR/5—LA1K 934 km.

Phone-sarja

1	OH3AZB	70	1249
2	OH1AJ	43	826
3	OH1SG	37	589
4	OH3AXN	33	511
5	OH4ZS	25	413
6	OH6HK	18	403
7	OH2BZN	59	368
8	OH2BVS	37	325
9	OH5OD	23	259
10	OH5YQ	16	199
11	OH2PZ	16	138
12	OH2AUA	27	119
13	OH2TE	26	108
14	OH7DF	7	107
15	OH2AZR	14	64
16	OH7KA	3	15
17	OH5MX	2	10

Pisin QRB OH3AZB—SM4GVF 500 km.

Lokakuun torstaitesti

1	OH0NC	30	833
2	OH2TI	33	794
3	OH1AWW	32	783
4	OH4OB	12	321
5	OH2DG	18	311
6	OH3AWW	11	268
7	OH6CL	9	244
8	OH3XU	10	231
9	OH6PA	9	222
10	OH1AXT	9	189
11	OH1UH	7	168
12	OH3CU/2	11	161
13	OH2AZR	2	19

Pisin QRB OH2TI—LA1K 844 km.

Lokakuun maanantaitesti

1	OH3XU	2	40
2	OH1AXT	1	13
3	OH2DG	1	7

Pisin QRB OH3XU—OH0NC 330 km.

IARU Region I VHF Contest 1985

Section 1 - 144 MHz single

1	OH1AWW	KP10DL	61	21533
2	OH4OB	KP32WE	31	13783
3	OH2BGJ	KP20JE	31	12050
4	OH6CL	KP13OU	23	6864
5	OH6UH	KP13IQ	19	5077
6	OH3MF/9	KP36UN	9	4130

Section 2 - 144 MHz multi

1	OH6AI	KP13MT	31	11232

Mikroaaltokisa 1985

1	OH2BWL	13	960
2	OH3CU	16	770
3	OH2AWW	7	440
4	OH2AUE	12	412
5	OH3MA	12	334
6	OH2AVR	5	142
7	OH3KT	4	126
8	OH2NM	3	122
9	OH2DV	3	98

Peter Lytz OH2AVP

Pakettiradio

Pakettiradiotoimikunta on pitänyt kesän ja syksyn aikana useita työkokouksia. Syksyn tapahtumat huipentuivat käyntiin posti- ja telehallituksen radio-osastolla. Vastassamme olivat Sappinen ja Länsman. Keskustelimme heidän kanssaan leppoisassa ilmapiirissä pakettiradiosta ja saimme käsityksen, että pakettiradiotoimintaan ei ole radio-osaston puolesta esteitä. Lupia tullaan ilmeisesti myöntämään niin nopeasti kuin on mahdollista. Radio-osastolla on kuitenkin paljon työtä, ja me radioamatöörit olemme radiotaajuuksien toissijaisija käyttäjiä, ja meidän on malttettava odottaa. Uskon että luvat ovat kunnossa ja hakijoiden kotona ihan lähiaikoina. Länsmanilla oli myös se toivomus, että ainoastaan ne jotka vakavissaan aikovat harrastaa pakettiradiotoimintaa, anoisivat lupaa siihen. Lupaa ei siis tulisi anoa ''kaiken varalta''.

Noodikontrollerin, TNC:n, tilanne

Suomen Radioamatööriliitto on saanut monistusoikeuden TAPR:n noodikontrollerin (TNC 1) ohjelmasta. SRAL tulee vielä käymään keskusteluja uudesta noodikontrollerista (TNC 2) ja mahdollisuuksista saada sen ohjelman monistusoikeus Suomeen. Jos saamme tämän oikeuden, meillä on kaikki edellytykset valmistaa rakennussarjoja Suomessa.

Pakettiradio ja VHF working group

SRAL:in pakettiradiotyötyhmä esittää VHF-managerin, OH2BEW, välityksellä ehdotuksensa taajuuksista ja modeemistandardeista VHF konferenssille. Ideamme on herättää keskustelua ja aikaansaada koko Region I:n käsittäviä standardeja. Ehdotamme muun muassa ensisijaiset pakettiradiotyöskentelytaajuudet sekä modeemistandardin.

Pakettiradio ja HF working group

Pakettiradiotoimikunta on lähettänyt kirjeen HF-managerille. Siinä ehdotamme periatteessa samat asiat kuin VHF-working group'ille, mutta myös sitä, että he harkitsisivat uudestaan julkilausumaansa, että pakettiradio ei ole radio-amatööritoimintaa.

Pakettiradiota Tampereella

Kävin Tampereella työasioissa lokakuun alussa, ja samalla otin tilaisuudesta vaarin ja keskustelin muutamien Tamperelaisten amatöörien kanssa pakettiradiosta. Tampereella vaikuttaa olevan suuri kiinnostus pakettiradioon, ja se on hieno juttu. Sovittiin epävirallisesti, että Tampereen ryhmä kohdistaa katseensa modeemiin ja hiukan myös yhteen uuteen mikropiiriin (WD 2511, X.25 interface).

Uusi pakettiradiosovitin

TAPR on tuonut uuden konstruktion markkinoille. Uusi kontrolleri käyttää M6809 prosessoria halvempaa Z80 prosessoria. Myös vaikeat komponentit kuten novram on korvattu toisilla ratkaisuilla. Ratkaisu vaikuttaa kaikin puolin enemmän kehittyneeltä kuin TNC 1, ja näinhän olla pitää — kehitys kulkee eteenpäin. Toivomme, että meillä on ensimmäiset koekappaleet Suomessa muutaman kuukauden sisällä.

Pakettiradioterveisin,
73 es GL de Peter, OH2AVP

Pakettiradiotyöryhmän kokous Räyskälässä (kuva OH2CX).

RA 11/85

1985 NOV 22 AM 11:36

Post Office Box 205
Holmdel, NJ 07733
201-741-1151 (H)
201-834-1149 (W)
November 19, 1985
U.S.A.

Mr. Paul Rinaldo, W4RI, Chairman
ARRL Ad Hoc Committee on Digital Communications
American Radio Relay League
225 Main Street
Newington, CT 06111

Dear Paul:

I will be unable to observe the December 7th Digital Committee meeting (I trust you have received my resignation letter dated the 11th of this month). Dispite my nonattendance, I would like to ask that the Committee consider the following items for this or a future Committee meeting.

Item 1: I am often asked what the Committee does and doesn't do. Is there a charter or mission statement for the Committee? Could something like this be developed?

Item 2: Would the Committee consider and make public its position on the desirability of using NRZI in combination with data randomizers (a al K9NG)? I have heard discussion that there is some interest in having HDLC NRZ systems drive the data randomizer directly, without benefit of NRZ to NRZI conversion. If such operation is possible, without the formation of degenerate data sequences during ABORT conditions, I would like to see the Committee encourage such operation. The NRZ-NRZI conversion would be one less chunk of hardware to deal with. As long as a randomizer is included, does NRZI encoding buy us anything?

Item 3: Would the Committee consider for adoption a standards document describing how radiogram messages should be constructed for computer traffic systems? I see this as a necessity to ensure that radiograms can be sorted and routed automatically by computers. In the new ARRL *Operating Manual* I see some suggestions for RTTY transmission of radiograms but the emphasis seems to be on reperforater operation rather than computer aided operation and routing. My reason for asking about a standards document is, I feel, that the radiogram format is still not detailed enough for computer operation. If the Committee would consider a formal proposal, I can have a draft prepared by the first of February. My purpose for such a standards document is not to change the format of the ARRL radiogram; it's exactly the opposite. My goal is to constrain the format to something that will allow computer scanning of radiograms for automatic forwarding. An additional goal is to ensure that a computer composed message may still be sent over part of its journey by either phone or CW without added operator effort. Can you suggest a dyed-in-the-wool traffic handler that could serve as a consultant for this project?

Item 4 I would like to see the Committee work with the IARU to specify some characters that are mutually agreeable to all interested amateur radio players for the undefined characters used in ITA#2. When that is completed, I would like the Committee to urge strongly that U.S.

and other manufacturers of electronic teleprinter software for computers include an option to use that ITA#2 character set. I would hope that this would allow a more standardized set of symbols for use worldwide on 5 level teleprinter circuits.

Well, there are my thoughts. If I can provide any additional information please don´t hesitate to call on me. Again, I´m sorry that I won´t be able to make it for the next Committee meeting.

Sincerely,

Paul

Paul Newland, ad7i

WESTNET MAP
145.01 MHz

Revised: November 18, 1985
Maintained by: WB6ASR @ W6AMT

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(Seattle, Wa --->  WN7ANK-5 -- WB7DCH <---Mailbox)  N7BI-4 <--Spokane, Wa)
                          \
                            \
(Portland, Or ---> W7XI-1 -- K7IFG
                      *
                      *
   (Eugene, Or ---> KS7Y-1
                      *
                      *
(Mt Ashland, Or --->       (to be installed)
                      * \
                      *   \
 (Redding, Ca --->    *  WA6YNG-1
                      *   /
                      * /
(St John Mtn --->    W6AMT-7 * * * * * * * * WA7DIA-1 <--- Reno, Nv)
                      *    *
                      *     *
                      *      *
                      *        *
                      *        W6BXN  <----- Mt Bullion, Mariposa, Ca)
(San Jose, Ca ---->  W6AMT * * * |  \
                       *  \      \  WA6OSA-2  <---- Mailbox)
                       *    \..... \    |
                       *          \  \  |
                        *           WA6YLB  <--- Blue Ridge)
  (King City, Ca ---->  W6AMT-1 - - - |
                        /  *
                       /   *
(Arroyo Grande --> W6IXU   *  <--- Mailbox)         (Potosi Mtn Las Vegas, Nv)
                         \  *                      * * * * * K7WS-1
 (Santa Barbara, Ca --->   W6AMT-2                *        * WA7HXO-1
                             *     *        * * AA6TN-1 <-- San Bernardino,Ca)
                              *      *     *     |
        (Los Angeles, Ca -->    *   W6AMT-3 -- N6BMO-1 <-- Orange County, Ca)
                                  *    *
                                    *   *
             (San Diego, Ca --->      * W6AMT-4
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Updates and revisions are welcome.
Please send to: Greg Campbell, WB6ASR
                  AMT - W6AMT
                  P. O. Box 700174
                  San Jose, Ca. 95170
or via W6IXU mailbox.

Project Oscar Inc.
POB 1136
Los Altos, Ca. 94023

November 1985

ORBITAL PREDICTIONS!

Project OSCAR Inc. is preparing a new set of orbital predictions for the period covering the calendar year 1986. The predictions will provide the UTC times and longitude for all south to north equatorial crossings of the two active Russian satellites carrying Mode A transponders (RS5 and RS7) and the two University of Surrey-Amsat scientific sattelites (O9 and O11). In addition, the UTC time, sub-satellite lattitude and longitude, and argument of perigee will be given for the apogee of each orbit of AMSAT's Phase III OSCAR-10 (AO-10) satellite. This document, when used with the appropriate plotter, will allow the user to determine the access times to all the presently available amateur radio satellites. The cost of producing and mailing this calendar necessitates a request for a minimum donation of $10.00 for mailings to the U.S., Canada and Mexico ($12.00 for all overseas destinations). The mailing of the orbital predictions will be made during the last half of December 1985.

NEW OPERATIONS MANUAL!

Project Oscar Inc. has undertaken the publication of the "The Amsat Phase III Satellite Operations Manual". This unique publication is an indispensible tool for understanding the functioning of and learning the proper operating procedures for the Phase III satellites. The cost of producing and mailing this 110 page manual requires a request for a minimum donation of $15.00. The manuals are available for immediate mailing.

To receive your copy of the orbital predictions or operations manual send completed mailing labels for each document (or use the ones below) and send them along with a check or money order payable to Project OSCAR Inc. A single check or money order can be used if ordering both documents.

To:- ______________________

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To:- ______________________

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